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Diphtheria Toxoid

A COMPARISON OF ONE DOSE OF ALUM PRECIPITATED WITH THREE DOSES OF UNMODIFIED TOXOID

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FOR the purpose of this study, an incomplete and preliminary report of which has already appeared (1), and in order to make the comparison as rigorous as possible, one routine lot (641) of approximately 20 litres of diphtheria toxoid was selected. From one portion, alum-precipitated toxoid was prepared; the other portion was kept in the unmodified state. The Lf value per cc. of the original lot was twenty. The flocculating serum used for determining the Lf value was standardized against the immunity unit (Washington) by intradermal test. There was agreement between the value ascribed to this flocculating serum as determined both by the flocculation method and the skin test method. The portion used as alum-precipitated toxoid was prepared with potassium alum in a final concentration of 2 per cent. The resultant precipitate was twice washed with saline and resuspended in a volume of saline such that the final suspension was shown to have 20 Lf's per cc. The concentration of alum in the final product was 0.958 mg. Al per cc., which is well below the maximum permitted under the United States and Canadian Regulations, namely, 1.3 mg. Al (2.15 mg. Al_2O_3). The suspension contained Merthiolate in a concentration of 1:10,000. In addition to the usual tests for antigenicity carried out at the Connaught Laboratories the preparation was also tested through the courtesy of the National Institute of Health, Washington. One human dose (1.0 cc.) yielded 3 units of antitoxin in guinea pigs within a period of six weeks and 0.5 cc. more than 2 units.

The children chosen for this study resided in institutions within easy access of Toronto. These institutions are designated school A, B and C, respectively. The ages of the children at school C were between five and fifteen; those at schools A and B represented a somewhat older group; young adolescents, in the main, but with a few children between eight and ten.

In order to obviate the reactions resulting from the injection of "diphtheria protein" contained in the toxoid, a Schick test was carried out on the children of schools A and B, using diluted (1/100) toxoid, in place of heated toxin, as a control. This skin test with diluted toxoid has been used in the Connaught Laboratories since 1926 (2) (3) (4) (5), and is commonly called the Toxoid

Reaction Test in Canada, the Moloney Test in England. Only those who were Schick positive and did not react to the reaction test (non-reactors) were chosen for this study. On the third day after the skin test was made, blood was drawn from each member of the group from schools A and B, in order to corroborate the interpretation of the Schick test. At school C, blood was drawn without a preliminary Schick or reaction test. Only those whose serum was shown to have no antitoxin* appear in the final compilation (tables I and II). The titrations were carried out after Römer's method as modified by Fraser (6).

Group I. One cc. alum-precipitated toxoid was given to members of group I (table I). Blood for the titration of diphtheria antitoxin was drawn after an interval of ten weeks, and again 12-14 months later. The results of individual titrations are shown in table I. It may be noted that the serum of each person was titrated at the beginning of the study and again ten weeks later. Titrations were also made upon seventeen sera drawn one month later; that is to say, fourteen weeks after the injection of alum toxoid. A Schick and a reaction test were carried out at the time of this bleeding. Sera from five persons of school B were unfortunately not obtainable at the twelve months' interval. Two sera from children E.S. and P.S. of school C are included in the table despite the fact that they were not titrated to an end point on account of the insufficiency of serum of these samples. One of these, P.S. of school C, has been excluded from the summary.

Certain facts emerge. Only one person, or if we included E.S. and P.S. above, three persons, did not show a measurable amount of antitoxin in response to the injection of toxoid. However, with six exceptions, the antitoxin response was distinctly poor. It is quite possible, indeed probable, that in the case of those whose response was exceptionally good there was some antitoxin present at the time of the initial bleeding but in an amount below the lowest level (1/500 unit) at which the titration was made. It would have been better to set the limit of testing at a lower level. One month later the antitoxin level had already dropped in fourteen of the seventeen sera titrated; none had shown an increase in antitoxin. It is suggested, from these and from other results to be presented in a later paper, that the maximum level of antitoxin is reached considerably before the fourteenth week. The results of the Schick test fourteen weeks after the injection of 1 cc. alum toxoid strongly suggest that the Schick level is at or about 1/250 unit per cc. of serum (7). Obviously the numbers are too small to be of significance. There is in addition the exception of the case of R.M., school A, which is disquieting. However, too much stress should not be laid upon this anomaly since readings were made on two occasions only; on the second and fifth day respectively. One important deduction, however, seems warranted. The Schick test is essentially a qualitative test and only roughly quantitative, and in the comparison of antigenic values of two toxoids the test is totally inadequate.

A summary of table III clearly illustrates the fall in antitoxin of the group as a whole during the year after the administration of toxoid. The level of 1/100 unit is somewhat arbitrarily chosen. The Schick level might have been

**The lowest limit of testing was for 1/500 unit per cc. of serum.*

more logically the one of choice. There is, however, at least, general agreement that persons having 1/100 unit per cc. of serum are Schick negative.

TABLE I

GROUP I—Response to One Dose of Alum Precipitated Toxoid—41 persons

NAME	Before 1 cc. A.P.T.		After 1 cc. of Alum Precipitated Toxoid			
	Units	Schick	10 weeks	14 weeks		12 to 14 months
			Units	Units	Schick	Units
School A						
R.M.	<1/500	+	>1/500 <1/100	<1/500	−	<1/500
S.S.	<1/500	+	>1/500 <1/100	<1/500	+	<1/500
E.R.	<1/500	+	>1/500 <1/100	<1/500	+	<1/500
A.L.	<1/500	+	>1/500 <1/100	>1/500 <1/250	−	<1/500
B.D.	<1/500	+	>1/500 <1/100	>1/500 <1/250	+	<1/500
D.T.	<1/500	+	>1/100 <1/50	>1/250 <1/100	−	>1/100 <1/50
G.N.	<1/500	+	1/50	1/50	−	>1/500 <1/250
N.S.	<1/500	+	1/50	1/50	−	>1/20 <1/10
E.L.	<1/500	+	>1/50 <1/10	>1/250 <1/100	−	>1/500 <1/250
E.P.	<1/500	+	>1/50 <1/10	>1/100 <1/50	−	>1/500 <1/250
L.W.	<1/500	+	>1/50 <1/10	>1/100 <1/50	−	>1/100 <1/50
R.A.	<1/500	+	>1 <3			>1 <3
School B						
J.D.	<1/500	+	>1/500 <1/100	<1/500	+	<1/500
B.S.	<1/500	+	>1/500 <1/100	<1/500	+	<1/500
H.B.	<1/500	+	>1/500 <1/100	<1/500	+	
H.P.	<1/500	+	>1/100 <1/50	>1/500 <1/250	+	>1/500 <1/250
L.B.	<1/500	+	>1/100 <1/50	>1/500 <1/250	+	
F.S.	<1/500	+	>1/100 <1/50	>1/250 <1/100	−	<1/500
L.D.	<1/500	+	>1/50 <1/10			>1/500 <1/250
C.M.	<1/500	+	>1/50 <1/10			>1/500 <1/250
P.G.	<1/500	+	>1/50 <1/10			>1/250 <1/100
F.M.	<1/500	+	>1/10 <1			1/10
J.M.	<1/500	+	>1/10 <1			
R.L.	<1/500	+	>1/2 <1			
A.N.	<1/500	+	>1 <5			1
A.M.	<1/500	+	>1 <5			
School C						
G.N.	<1/500		<1/500			<1/500
J.K.	<1/500		1/400			1/500
L.H.	<1/500		>1/250 <1/100			<1/500
A.S.	<1/500		>1/250 <1/100			<1/500
E.S.	<1/500		<1/100			<1/500
S.G.	<1/500		1/100			>1/500 <1/250
P.M.	<1/500		1/100			>1/250 <1/100
J.G.	<1/500		1/80			<1/500
K.H.	<1/500		1/80			<1/500
R.F.	<1/500		1/80			>1/500 <1/250
M.S.	<1/500		1/80			>1/500 <1/250
D.S.	<1/500		>1/80 <1/50			<1/500
*P.S.	<1/500		<1/50			>1/500 <1/100
J.G.	<1/500		1/50			1/50
Mt. S.	<1/500		1/50			1/100

*P.S. is not included in summary of table I in the 10 week column, but is included in12-14 months column.

These results are not dissimilar to those of Lai (8) who found that 62.7 per cent of initially Schick positive persons were Schick negative at five months, following 1 cc. alum-precipitated toxoid (9 Lf's).

Group II. This group is comprised of inmates of schools A and C, and differs from group I only in the one particular, namely, that three doses, 0.5 cc., 0.5 cc. and 1.0 cc., of unmodified toxoid (lot 641) were given. At school A the interval between the first and second dose was six weeks; between the second and third, eleven days. At school C the interval between each dose was three weeks. As in group I, blood was drawn ten weeks after the first dose of toxoid and again twelve to fourteen months later. The results are shown in table II.

TABLE II

GROUP II—Response to Three Doses of Unmodified Toxoid—35 persons

NAME	Before 3 Doses of Unmodified Toxoid		After 3 Doses of Toxoid			
			10 weeks	14 weeks		12 to 14 months
	Units	Schick	Units	Units	Schick	Units
School A						
S.B.	<1/500	+	<1/500	<1/500	+?	1/100
C.C.	<1/500	+	>1/500 <1/100	>1/500 <1/250	+?	>1/100 <1/50
O.R.	<1/500	+	>1/500 <1/100	>1/500 <1/250	−	>1/100 <1/50
R.W.	<1/500	+	>1/50 <1/10			>1/250 <1/100
L.M.	<1/500	+	>1/50 <1/10			>1/50 <1/20
L.S.	<1/500	+	1/10			>1/100 <1/50
M.J.	<1/500	+	1/10			1/50
L.V.	<1/500	+	>1/10 <1			1/100
G.S.	<1/500	+	>1/10 <1			>1/100 <1/50
S.R.	<1/500	+	>1/10 <1			1/50
D.B.	<1/500	+	>1/10 <1			>1/50 <1/20
J.C.	<1/500	+	>1/10 <1			>1/50 <1/20
M.B.	<1/500	+	>1/10 <1			>1/20 <1/10
I.T.	<1/500	+	>1/10 <1			>1/10 <1/5
P.B.	<1/500	+	1			>1/50 <1/20
J.H.	<1/500	+	1			1/10
L.J.	<1/500	+	>1 <2			>1/50 <1/20
R.C.	<1/500	+	>1 <3			1/10
A.B.	<1/500	+	>1 <3			1/10
J.B.	<1/500	+	>1 <3			>1/10 <1/5
E.H.	<1/500	+	>2 <5			1/5
E.D.	<1/500	+	5			1/20
N.T.	<1/500	+	>1/10 <1			
B.C.	<1/500	+	>1/10 <1			
H.S.		+	>1/10 <1			
School C						
C.M.	<1/500		1/40			1/20
D.M.	<1/500		>1/10 <1/2			>1/100 <1/50
M.S.	<1/500		>1/10 <1/2			>1/10 <1/2
J.L.	<1/500		>1/10 <1/2			>1/10 <1/2
V.L.	<1/500		1/2			1/10
J.S.	<1/500		>1/2 <1			1/10
W.D.	<1/500		1			>1/10 <1/2
V.B.	<1/500		>1 <2			>1/10 <1/2
L.F.	<1/500		2			>1/10 <1/2
A.K.	<1/500		2			1

The level of antitoxin after three doses of unmodified toxoid is distinctly higher than in those given one dose of alum-precipitated toxoid. One person, as in group I, failed to develop measurable antitoxin (1/500 unit) in response to three doses. Three persons only of group II were Schick tested. It is of interest that these three showed an increase of antitoxin at the yearly interval.

It is suggested that the increase may have resulted from the stimulus of the Schick test and control (0.1 cc. toxoid 1/100). As will be shown in a later paper, this result frequently obtains in those persons who have antitoxin at the time of skin testing. This increase may persist for at least a year, though commonly the level of antitoxin at the interval of one year is below the peak to which it had risen after the Schick test. The serum of one other, C.M. of school C, showed a slight rise in antitoxin after one year. This is unexplained. Were the rise due to the stimulus of diphtheria infection one might normally expect a much greater increase in antitoxin (5) (1). As in group I, after one year the decrease in antitoxin level, individually considered, is general. However, considered as a group, and in contrast to group I, the antitoxin is maintained at a relatively high level. This is illustrated in table III.

TABLE III

SUMMARY OF TABLE I AND TABLE II
Distribution of Sera according to Antitoxin Level Original titres <1/500 unit

Units	After 10 weeks		After 12 to 14 months	
	1 dose alum	3 doses unmodified	1 dose alum	3 doses unmodified
<1/500	1	1	15	—
<1/100	1	—	—	—
1/500	—	—	1	—
>1/500<1/100	9	2	1	—
>1/500<1/250	—	—	9	—
>1/250<1/100	2	—	2	1
1/100	2	—	1	2
>1/100<1/50	9	—	2	5
1/50	4	—	1	2
>1/50 <1/10	6	3	1	8
1/10	—	2	1	5
>1/10 to 1	3	18	1	9
>1 to 5	3	9	1	—
Total	40	35	36	32

	No.	%	No.	%	No.	%	No.	%
1/100 unit or less.....	15	38	3	9	29	81	3	9
>1/100 unit...	25	62	32	91	7	19	29	91
1/50 unit or less	28	70	3	9	32	89	10	31
>1/50 unit....	12	30	32	91	4	11	22	69

The response to the injection of toxoid, either as alum precipitate, or unmodified, in persons who have "natural" antitoxin, is strikingly illustrated by the results shown in table IV. The children of this group were chosen for the purpose of determining whether one dose of alum-precipitated toxoid would effect a greater response in antitoxin than would three doses of unmodified toxoid. Lot 641 was used throughout. From these results, as one had anticipated, it is not apparent that the superiority of one antigen over the other can be determined in such persons. However, these data again

emphasize the inadequacy of the Schick test in a study of the comparative antigenic values of diphtheria antigens. Though a Schick test was not carried out on the children of this group, it is not unlikely that some of them, whose

TABLE IV

RESPONSE IN PERSONS WITH "NATURAL" ANTITOXIN
Following One Dose Alum

Name	Before 1 cc. Alum Ppt. Toxoid	After 1 cc. Alum Ppt. Toxoid	
		10 weeks	12 to 14 months
		Units	Units
School B			
H.C.	>1/250 <1/100	1	1/2
G.P.	>1/250 <1/100	15	2
A.S.	1/100	1/2	1/10
G.L.	1/10	>2 <5	
J.B.	>1/10 <1/2	>2 <5	1/2
D.R.	>1/10 <1/2	>5 <10	4
L.S.	>1/10 <1/2	>5 <10	2
G.C.	>1/10 <1/2	10	
S.K.	>1/10 <1/2	>15 <20	
J.M.	>1/10 <1/2	>5 <10	
F.G.	>1 <2	3	
A.D.	>2 <3	>5 <10	
J.D.	>2 <3	5	
H.V.	3	5	2
School C			
E.P.	>1/500 <1/250	15	>1 <5
M.G.	>1/250 <1/100	>10 <15	

Following Three Doses Unmodified

Name	Before 3 Doses Toxoid	After 3 Doses Toxoid	
		10 weeks	12 to 14 months
School A			
R.M.	>1/500 <1/100	>2 <5	>1/5 <1/2
P.S.	>1/500 <1/100	>2 <5	1
T.T.	1/20	5	>½ <1
H.J.	>1/20	20	>4 <8
O.H.	1/10	25	10
I.M.	>1/10 <12	>2 <4	>1/5 <1/2
B.C.	1/2	>5 <10	>2 <4
D.H.	1/2	>5 <10	>2 <4
H.S.	1/2	>5 <10	>1 <2
C.W.	1/2	20	>4 <8
School C			
R.B.	>1/500 <1/250	35	>2
J.B.	>1/500 <1/250	>2 <4	
G.M.	>1/500 <1/250	>4 <8	

serum showed small amounts of antitoxin (>1/500<1/250), would have been Schick positive before the injection of the diphtheria antigen. It is of interest to note that the response in those who have initially a relatively low level may be as good or better than in those whose initial level was high.

SUMMARY AND CONCLUSIONS

1. A comparison of the antitoxin response to one dose of alum-precipitated toxoid and three doses of unmodified toxoid has been made in (*a*) persons with no antitoxin(<1/500 unit); (*b*) in persons with measurable antitoxin. The alum-precipitated toxoid was prepared from the same lot as the unmodified toxoid; each had a flocculating value of 20.

2. Antitoxin titrations of serum show that the response to three doses of unmodified toxoid is distinctly better than the response to one dose of alum-precipitated toxoid in those having no initial antitoxin.

3. Of the one dose alum group, at ten weeks, sixty-two per cent had more than one-one hundredth of a unit of antitoxin per cc. of serum; of the three dose unmodified toxoid group, ninety-one per cent had more than one-one hundredth of a unit, ten weeks after the first dose. After one year, only nineteen per cent of the alum group remained above the one-one hundredth level, whereas ninety-one per cent of the three dose unmodified group remained above that level. If one-fiftieth of a unit is taken as the measure of antitoxin response, the figures for the alum group are thirty per cent at ten weeks and eleven per cent at one year, as contrasted with ninty-one per cent, and sixty-nine per cent, in the three dose unmodified group.

4. For a comparison of the antigenic value of the two methods of immunization the necessity of excluding those persons with initial antitoxin is demonstrated.

5. The inadequacy of the Schick test for such a comparative study is demonstrated.

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Serial Titrations of Diphtheria Antitoxin Following Toxoid

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IN a previous paper (1) certain data relative to the response in older children to two diphtheria antigens of common origin but of dissimilar properties and differing in dosage were presented. This study did not concern itself with the question of whether one dose of alum-precipitated toxoid should or should not be substituted for the three doses of unmodified toxoid commonly used for active immunization in Canada and elsewhere during the last eight years. Nor was the superiority of alum-precipitated toxoid, as an antigen, over unmodified toxoid under investigation. Anyone who has compared these two preparations in their ability to stimulate the production of antitoxin in guinea pigs when given one dose of equivalent Lf value is left in no doubt of the superiority of the former. The purpose of the experiment recorded was to determine the levels of antitoxin response as demonstrated by the titration of antitoxin at certain intervals of time after the administration of one dose of alum-precipitated toxoid and after three doses of unmodified toxoid. The antigens were of common origin, each preparation contained 20 Lf's per cc. and both were proved to be of satisfactory potency when tested in guinea pigs. Though the data obtained are somewhat meagre and the period of observation short they indicate that under the conditions of the experiment one dose of alum-precipitated toxoid is inferior to three doses of unmodified toxoid.

In a study of this character the necessity for a suitable basis of comparison or yardstick is very evident. Whatever kind of diphtheria antigen be employed in a group of selected human beings the antitoxin response to its use can be quantitatively determined at certain intervals of time. The larger the group and the longer the time under observation the more accurate will be the data upon which a standard of comparison may be established. With this yardstick the results obtained with other antigens and other dosage may be measured in regard to level of antitoxin attained, length of time maintained or rate of fall.

Persistence of Antitoxin in an Immunized Group

A study of this sort entails a great deal of work, demands the co-operation of parents, and involves the expenditure of much time and the exercise of tact. Though the work is still in progress, the following tables I and II illustrate the results obtained up to the present in a group of initially Schick positive toxoid non-reacting (Moloney test negative) children, after the injection of three doses (0.5, 0.5, 1 cc. at intervals of three weeks) of unmodified toxoid of eighteen to twenty-five Lf's per cc.

Table I illustrates the results of the antitoxin titration of one hundred and fifty-eight sera from one hundred and five children. The numbers in the monthly groups are too small to be of much significance; one hundred should be the minimum. However, it is evident that, in the group as a whole, there is in general a falling off in antitoxin. This loss of antitoxin is more strikingly illustrated in table II, made up of individuals selected from the previous table. The sera of eleven and of twenty-three and of fourteen children were titrated,

TABLE I

PERSISTENCE OF DIPHTHERIA ANTITOXIN IN AN IMMUNIZED GROUP ORIGINALLY SCHICK POSITIVE

Age Group 5 Years to 16 Years

Months after 3 doses toxoid	No.	Units				
		>1/250<1/100	>1/100–1/50	>1/50–1/10	>1/10–1/2	>1/2–10
3	36	5% (2)	3% (1)	14% (5)	53% (19)	25% (9)
6	39		8% (3)	30% (12)	54% (21)	8% (3)
9	40	2.5% (1)	5% (2)	32.5% (13)	47.5% (19)	12.5% (5)
12	25	8% (2)	4% (1)	44% (11)	32% (8)	12% (3)
18	18		5.5% (1)	50% (9)	33.5% (6)	11% (2)
Total....	158					

TABLE II

PERSISTENCE OF DIPHTHERIA ANTITOXIN IN INDIVIDUALS SELECTED FROM TABLE I

Months after 3 doses toxoid	No.	>1/100 to 1/50	>1/50 to 1/10	>1/10 to 1/2	>1/2 to 10
3	11		2	8	1
9	11	2	4	4	1
6	23	1	7	14	1
12	23	1	11	8	3
9	14		5	7	2
18	14	1	7	4	2

one group at three and at nine, the other at six and at twelve, the third at nine and eighteen months after having received three doses of unmodified toxoid. The results appear in very abbreviated form; individual titrations are not shown, nor are the narrow limits of antitoxin titration which were carried out indicated.

In following the individual changes in antitoxin level, the factor of intercurrent diphtheria infection must obviously be considered. Fortunately, within the year of observation diphtheria has not been prevalent in Toronto.

However, two children, brother and sister, showed a striking increase in the antitoxin content of their sera between the ninth and twelfth month after having had toxoid. The one showed an increase from $>1/50<1/20$ to $>1<2$ units per cc.; the other, from $>1/10<1/5$ to $>2<4$. These two titrations appear as two of the three listed in table II under 1/2 to 10 units at twelve months. One may presume that the children were carriers of virulent diphtheria bacilli at some time within that interval (2).

The question of the persistence, increase, decrease or disappearance of antitoxin in the blood stream is of great academic interest and possibly of great practical importance. Unfortunately, the Schick test is not adequate for the solution of this problem. One must resort to the expedient of quantitative assay in lower animals. It may be necessary for protection against diphtheria to immunize beyond the Schick negative state, which, after all, means only that at least 1/250 unit of antitoxin per cc. of serum is present in the blood stream. Any given toxoid may, in any individual case, result in the development of antitoxin to a level just beyond that at which the Schick test will be positive. Within a certain time the antitoxin may drop below that level. The factor of intercurrent infection with the diphtheria bacillus cannot be relied upon to maintain or increase the level of antitoxin. If the generalization could be made that the higher the level of antitoxin be raised by active immunization the longer the antitoxin will be maintained above the Schick level, much of the doubt concerning the dosage of toxoid would disappear. The duty of health authorities would obviously be to recommend a dosage, and possibly a subsequent injection, of toxoid which, within the limits of practicability, would best achieve this end.

Within the past few years data have been obtained relative to the question of the persistence or loss of antitoxin in the blood stream of certain groups of persons. These data are presented chiefly for the purpose of illustrating the complexity of the problem, certainly not with the idea of suggesting that they form a basis for its solution.

Antitoxin Titrations of Schick Negative Adults after Small Amounts of Toxoid

Table III shows the results of titration of antitoxin in a group of adults originally Schick positive and given various amounts of diphtheria toxoid. The majority received 0.5, 0.5 and 1 cc. at three weeks' interval. The original titres are incomplete and inadequate. It is apparent that the tendency is towards a loss of antitoxin; there are, however, a few striking exceptions.

In contrast to the above group are the results (table IV) in a group of adults who were Schick negative and who had been given relatively small amounts of diphtheria toxoid, 0.1 to 0.5 cc. in two to four doses. K.P. received a Schick test and diluted toxoid (1/100) control only. On the whole the response in antitoxin is distinctly better than in the previous group. Two only are known to have returned to their original titre; one showed no response within the limits of titration; two had not had a determination made to show the limits of titre; one had no initial titre made. One is struck by the fact that approximately half of the group have maintained their antitoxin level,

within the limits of titration, undiminished for a period of years. The group is being followed from year to year and eventually some conclusion may be drawn from the accumulated data.

TABLE III

ANTITOXIN TITRATIONS OF ACTIVELY IMMUNIZED ADULTS, INITIALLY SCHICK POSITIVE

Initials	Original Titre	1935	1934	1933	1932	1931
H.P.		1/50	>1/50<1/20	>1/50<1/20	>1/50<1/20	>1/10<1/2
M.R.	<1/100	1	>1<3	>1<3	>1<3	3
L.M.	<1/50	>1/50 <1/20	>1/50<1/20	>1/50<1/20	>1/50<1/20	>1/25<1/10
H.F.		>1<3	>1<3	>1<3	5	
M.T.	<1/50		>1/10<1/2	>1/10<1/2	1/2	
C.H.	<1/50	>1/10 <1/2	>1/10<1/2	>1/10<1/2	>1/10<1/2	
R.D.	<1/100	1/20	>1/20<1/10	>1/20<1/10	>1/10<1/2	
B.K.	<1/50	>1/100<1/50	>1/50<1/20	>1/50<1/20	>1/25<1/10	
N.S.		>1<3	>1<3	>1<3		
M.B.	<1/100	1/20	>1/20<1/10	1/10		
E.B.	<1/100	>1/50 <1/20	1/20	>1/10<1/2		
P.S.	<1/100	>1/50 <1/20	>1/50<1/20	>1/10<1/2		
A.C.	<1/100	>1/2 <3/4		1		
M.Mc.	<1/100	>1/50 <1/20		>1/50<1/20		
R.D.	<1/500	>1/20 <1/10	>1/10<1/5			

TABLE IV

ANTITOXIN TITRATIONS OF SCHICK NEGATIVE ADULTS AFTER SMALL AMOUNTS OF TOXOID

Initials	Original Titre	1935	1934	1933	1932
F.T.	>1/2<1	>1<2		>1<2	
A.R.	>1/2<1	>1<2		>2<3	
A.C.	>1/2<1			2	>2<4
J.G.	1/2	6	6	>6<8	10
E.P.	>1/10 <1/2	1	>1<2	>1<2	2
A.M.	>1/10 <1/2	>1/10<1/2	>1/10<1/2	>1/2 <1	1
A.B.	>1/10 <1/2		>1/2 <1	>1/2 <1	>1/2 <1
A.S.	>1/10 <1/2	1/2	1	1	
N.R.	>1/10 <1/2	>1/10<1/2	>1/2 <1	1	
J.C.	>1/10 <1/2	>1/10<1/2		>1/10<1/2	
C.D.	>1/10	3	3	3	
E.M.	>1/10	>1<2	>1<2	>1<2	
G.M.	>1/25 <1/10	>1/10 <1/2	>1/10<1/2	>1/10<1/2	>1/10<1/2
W.H.	>1/50 <1/20	>1/2 <1	>1/2 <1	>1<2	
T.K.	>1/100<1/10	>1/10<1/2	>1/10<1/2	>1/10<1/2	
A.B.	>1/100<1/10	>1/10<1/2	>1/10<1/2	>1/10<1/2	
K.P.		6	6	>5<10	10 [20(1931)]

Response to a Schick Test and Control Test

In table V are shown the results in fourteen persons, ten of whom initially had antitoxin in the amounts indicated, four had none (<1/500 unit). Each of the group was given a Schick test with diluted toxoid control (reaction test). The first four reacted to the diluted toxoid control; the rest did not. The antitoxin response when it occurs is rapid; in some instances the apparent maximum is reached within twelve days, in others the titre is higher at five weeks. At eleven weeks none showed a rise above the level shown at five

weeks. Three persons showed no response within the limits of titration. Of the four without initial antitoxin (<1/500 unit) none responded within twelve days. In another series not reported here it was found that the non-response to a Schick test and control is the rule, to which there are a few exceptions, in persons without initial antitoxin (<1/500). Probably those who do respond have amounts of antitoxin which are not detected at the 1/500th level of titration. Obviously the group shown in table V is too small

TABLE V

RESPONSE TO A SCHICK TEST AND CONTROL

Initials	Units before Schick test	Units after Schick test				
		12 days	5 weeks	11 weeks	6 months	16 months
W.A.	>1/50 <1/20	4	6	>3<5	>2<3	>1<2
E.B.	>1/10 <1/2	>1/2 <1	>1<2	>1<2	>1/2 <1	>1/2 <1
C.S.	>1/50 <1/20	1/2	>1/5 <1/2	1/5	>1/20<1/10	>1/50<1/20
S.M.	1/10	>1/10<1/2	>1/10<1/2	>1/10<1/2		1/10
J.M.	>1/500<1/100	>1/5 <1/2	>1/5 <1/2	>1/10<1/5	1/20	>1/50<1/20
K.B.	>1/500<1/100	>1/100	>1/5 <1/2	>1/5<1/2	>1/10<1/5	>1/20<1/10
J.McB.	>1/10 <1/5		2	>1/2 <1		
C.G.	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2
J.K.	>1/10 <1/5	>1/10<1/5	>1/10<1/5	>1/10<1/5	>1/10<1/5	>1/10<1/5
J.P.	1/10	1/10	1/10	1/10	1/10	1/10
H.A.	<1/500	<1/500				
C.P.	<1/500	<1/500				
G.W.	<1/500	<1/500				
E.P.	<1/500	<1/500				

to allow of any conclusion. The results serve to illustrate the wide variation in individual response to the very small quantity of antigen (1/50 M.L.D. toxin plus 0.001 cc. toxoid) given intradermally and the rapidity with which this response occurs.

Control Group—Natural Antitoxin

Table VI shows the results obtained in a group of adults who possess natural antitoxin, but have had no Schick test and no toxoid. Certain members of this and the following control group have been followed since 1924 and reported upon by FitzGerald (3) and FitzGerald and Fraser (4).

TABLE VI

CONTROL GROUP—NATURAL ANTITOXIN

Initials	1935	1934	1933	1932	1931	1930
A.M.	>2<3	>2<3	3	3	>5<7	5
K.H.	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2	>1/5 <1/2
A.H.C.	>1/10<1/5		>1/10<1/5	>1/10<1/5	>1/10<1/5	>1/10<1/5
A.C.	>1/10<1/5	>1/10<1/5	>1/10<1/5	>1/10<1/5		
E.K.	1/5	1/5				
A.D.	>1/10<1/5	>1/10<1/5				

However, their numbers have been greatly depleted due to the fact that many have served as volunteers for the experimental trial of various diphtheria antigens. With one exception there has been no evidence of change in antitoxin titre. The exception, *A.M.*, is a bacteriologist who is in frequent contact with diphtheria cultures.

Control Group—No Natural Antitoxin

A second control group, table VII, the counterpart of the above, consisted of adults having no natural antitoxin (<1/500 unit) and who have had neither

TABLE VII

CONTROL GROUP—NO NATURAL ANTITOXIN

Name	1935	1934	1933	1932	1931	1930	1929
O.S.	<1/500	<1/500	<1/100	<1/100	<1/100	<1/100	<1/100
J.R.	<1/500	<1/500	<1/100	<1/100	<1/100	<1/100	<1/100
F.H.	<1/500	<1/500	<1/100	<1/100	<1/100	<1/100	<1/100
J.F.	<1/500	<1/500	<1/100	<1/100	<1/100	<1/100	<1/100
D.S.	<1/500	<1/500	<1/100	<1/100	<1/100	<1/100	
R.P.	<1/500	<1/500	<1/100	<1/100			<1/100
M.B.	<1/500	<1/500	<1/100	<1/100			
B.S.	<1/500	<1/500					
C.B.	<1/500		<1/100	<1/100	<1/100	<1/100	<1/100
E.Mc.		<1/500	<1/100	<1/100	<1/100	<1/100	<1/100
J.C.		<1/500	<1/100	<1/100			
M.P.			<1/500	<1/100	<1/100	<1/100	<1/100
W.S.				<1/100	<1/100		<1/100

toxoid nor Schick tests. This group has similarly suffered depletion. The sera of thirteen have been titrated approximately yearly and in no instance has antitoxin been demonstrated within the limits of the test.

Summary

The importance of a standard of measurement for assessing the response to a diphtheria antigen is emphasized.

Serial titrations of diphtheria antitoxin have been carried out on the sera of selected groups of persons.

The persistence or loss of antitoxin in human beings are complex phenomena.

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Communicable Disease as Administered by the Department of Pensions and National Health*

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THE Health Branch of the Department of Pensions and National Health deals with communicable diseases under the divisions of quarantine, medical immigration and sick mariners.

The major quarantinable diseases, smallpox, cholera, plague, yellow fever and typhus, are the concern of the quarantine division. Other communicable diseases occurring among crews or passengers on vessels arriving from foreign countries are handled by both quarantine and medical immigration divisions, depending on the accommodation provided at the port. Such diseases occurring among the crews of vessels at the smaller outports are treated according to the best arrangements that can be made at each port.

The quarantine division maintains well-equipped stations at Halifax, N.S., Saint John, N.B., Grosse Isle, Que., and William Head, B.C. These are situated convenient to the approach of the main lines of Canada's passenger traffic. These stations have 241 hospital beds, which can be expanded to meet any emergency that may arise. There are also 1,946 detention beds available for the use of contacts. With the exception of Halifax, these stations have well-equipped laboratories, large enough to handle any number of specimens that the traffic involved could require. An incubator room is being provided at Halifax in connection with the Provincial Laboratory and arrangements made with the staff for the handling of specimens. There are disinfectors and baths at each station capable of quickly handling large amounts of luggage and bedding or other materials, and of bathing passengers and crews. Special care is taken to ensure that all buildings and equipment are available for use at any time.

The medical immigration division has a well-equipped hospital at Quebec consisting of 99 beds, of which 53 are designed for isolation use.

The sick mariners division maintains small hospital units at six of the smaller ports in Nova Scotia where there is no other accommodation. In addition, this division has arrangements in practically all ports in the five Maritime provinces named in the Act whereby provision is made for the care of sick mariners. This is done by contract with hospitals and sanatoria and by port physicians appointed either on a salary or a fee basis.

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A summary of the foregoing shows a total of 2,322 beds owned and maintained by this department for the purposes described.

Weekly returns are made to the department of all communicable diseases reported. During the past five years from 1929-30 to 1933-34 97 cases were hospitalized in the quarantine division and 306 contacts were detained; the medical immigration division recorded 512 cases hospitalized and 196 contacts who also were hospitalized. In both these divisions it should be remembered that the sickness recorded represents that found on arrival. The total number examined in the quarantine division has fallen during these years from 533,157 in 1929-30 to 294,870 in 1933-34. The largest number of cases held was 48 in 1929-30, with 230 contacts, and 33 cases and 61 contacts in 1930-31, with a much smaller number in the remaining years, as for example 9 cases and 9 contacts in 1933-34.

During the five years 16 cases of chickenpox and 23 contacts were held; 16 cases of influenza with 170 contacts; 28 cases of measles with 47 contacts; 8 cases of mumps and 18 contacts; 8 cases of scarlet fever and 13 contacts; 16 cases of smallpox and 24 contacts; 1 case of whooping cough and 7 contacts; and 3 cases of erysipelas.

During the five years immigration into Canada has been greatly curtailed. In 1929-30, 131,185 persons were examined; in 1930-31, 62,975; in 1931-32, 10,831; in 1932-33, 6,188; and in 1933-34, 5,278.

In addition to diphtheria, measles, mumps, scarlet fever, whooping cough and other acute communicable diseases, 8 cases of tuberculosis, 35 cases of pneumonia, 8 cases of trachoma, and 13 cases of venereal disease were found.

The immigration medical division has also certified as prohibited of entry under section 3 ss (b) of the Immigration Act as follows:

	1929-30	1930-31	1931-32	1932-33	1933-34	Totals
Examined by Medical Officers overseas	56,665	51,523	10,273	6,021	5,814	130,296
Certified by Medical Officers overseas	708	171	35	13	20	947
Certified by Medical Officers at Canadian ports.....	26	13	4	5	5	53

The section referred to reads: "Persons afflicted with tuberculosis in any form, or with a disease which is contagious or infectious" . . . . etc. For the purpose of this discussion it may be regarded as corresponding to the schedule under consideration. Under this authority 1,000 individuals have been prohibited entry during this time. The importance of this should be emphasized from the potential danger as sources of infection and from the economic aspect. Had they entered Canada many of these people would in all probability have become public charges and eventually faced deportation, with all its accompany-

ing disappointment and heartbreak to the individuals concerned and cost to the public. An investigation of the cost of institutional care prior to deportation has shown an average of $1,500 each for a few unselected cases.

A brief explanation regarding the sick mariners division may be in order. Part V of the Canadian Shipping Act requires that "medical and surgical attendance and such other treatment as the case requires" must be given to all members of the crews of vessels paying dues. Dues are collected at ports of Nova Scotia, Prince Edward Island, New Brunswick, Quebec and British Columbia. They are payable by all vessels from foreign countries, by those trading between the provinces named, and by such fishing vessels of Canadian registry as choose to pay.

During the five-year period the number of mariners eligible for benefits has decreased from 96,590 in 1929-30 to 75,447 in 1933-34. Taking the year 1933, 68,854 or 91 per cent belonged to foreign trading vessels spending from 4 to 8 weeks in Canadian waters during the year. The remaining 6,953 (9 per cent) were crews of vessels continually in Canadian waters and were eligible for the benefits for from 6 to 12 months in the year. The number of cases treated ranged from 1,178 in 1929-30 to 897 in 1933-34. A total of 5,174 cases received treatment for communicable diseases, including pneumonia, tuberculosis and venereal disease. The number of communicable diseases represented 17 per cent of the total patients treated for all causes. Injuries accounted for 21 per cent of the total patients, being an indication of the hazardous nature of seafaring life. Malaria, which was not included in the total for communicable diseases, was responsible for 59 cases during the five-year period. Malaria is a considerable cause of illness among foreign-going sailors. Cases of bronchitis, which also were not included in the total, numbered 657, indicating the importance of this condition as a cause of disability. During this period there were 258 cases of tuberculosis, 1,137 of influenza, 154 of pneumonia, 89 of typhoid fever, and 3,381 of venereal disease, or 11 per cent of the total patients. The importance of venereal disease is further illustrated by an analysis from the returns of one of the larger hospitals for a period of six months, which shows that of the 3,270 hospital days 728 (22 per cent) were accounted for by venereal diseases.

Treatment given seamen in the various clinics is in conformity with the Brussels Agreement of 1924, to which Canada subscribes. Patients are detained in hospital only during the acute stage and when bed treatment is indicated, so that the seaman does not lose his ship if it can be avoided. He is given an individual record card, according to an international model, which he takes with him, if he so wishes, for the guidance of medical officers at subsequent clinics.

No cases of bubonic plague were treated during the years under review; yet one of the important functions of the quarantine division is to endeavour to prevent the spread of this disease by eliminating as far as possible the rat population on vessels. Our regulations in this regard are in conformity with the International Sanitary Convention of 1926. During these five years our

medical officers inspected 1,268 vessels. Of these, 432 were granted exemption certificates on the basis that there was no evidence found of recent rat infestation. The remainder, 836, were actually fumigated and 4,822 dead rats recovered. A summary of the report of this work for the year 1930, as carried on under the supervision of the William Head Station, chiefly at Vancouver, might be given. The total number of vessels inspected was 132, of which 128 were fumigated and 4 exempted. Of these 81 were from potentially plague infested areas. The total number of rats recovered was 669, and 147 mice were also obtained. Of the rats 391 were *Mus. Alexandrinus* and 116 were *Mus. Ratus*; 554 were found in the holds of vessels, 112 in storerooms, and 3 in living quarters. Laboratory examination was made of 507 rats and all were found negative for plague.

In reference to smallpox, our experience has convinced us that the old fear and dread of this disease was fully warranted. One patient died on the third day following the first symptoms, and before death the odour was so terrible as to make nursing very difficult. One patient became generally haemorrhagic and died before any definite rash appeared, justifying the old name of "black" smallpox. A nurse whose vaccination scar was not considered satisfactory was vaccinated before being allowed to contact the patients. She became ill on the sixth day following and ran a mild although typical attack of smallpox, her vaccination developing coincident with the disease. Another individual of young adult age, without previous vaccination, was exposed to the disease and vaccinated immediately. The vaccination took, but the disease developed at the same time and ended fatally.

Probably the most serious challenge that this service has had to meet in recent years was in 1929 when 318 passengers and attendants were landed from one vessel. Of these, 18 were admitted to hospital and four died. The disease was a severe form of influenza with pneumonia.

SUMMARY

The Health Branch of this department has administered 7,285 cases and contacts of communicable disease in the last five years. The medical immigration division has certified as prohibited of entry many cases of chronic infectious disease. The quarantine division has treated acute infectious disease and prevented its entry, and in addition has supervised our foreign ocean-going commerce so as to prevent the introduction of rat plague into our ports. The sick mariners division has given treatment to the international sailor in our ports as well as to many of our own seamen and fishermen.

The Present Anti-Tuberculosis Program in Ontario*

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FOR many years the tuberculosis mortality rates throughout the world have been steadily declining. In 1905 the average rate of twenty-five countries in the temperate zone was 189 and in 1929 it was 94 per 100,000. During the same period the rate for all forms of tuberculosis in Ontario fell from 120 to 51.

The factors which have caused the downward trend in the mortality of this disease are many but their exact spheres of influence remain somewhat obscure. The several factors which have been most important in the decline of the disease are the improved standard of living, improved sanitation, tuberculosis hospitalization, and public health education.

The standard of living has probably a greater influence on the tuberculosis death rate than any other factor. The industrial classes have rates more than twice as high as have commercial and professional workers.† The standard of living has greatly improved during the past thirty years. As poverty is still further reduced, tuberculosis mortality will fall still further. Improvement in sanitation has gone hand in hand with improved economic conditions. This would include the safeguarding of milk supplies and the inspection of all food supplies. Clinics and hospital facilities have increased but the high standard of living and better environmental conditions have probably had the greatest effect in the lowering of the tuberculosis death rate.

Mortality

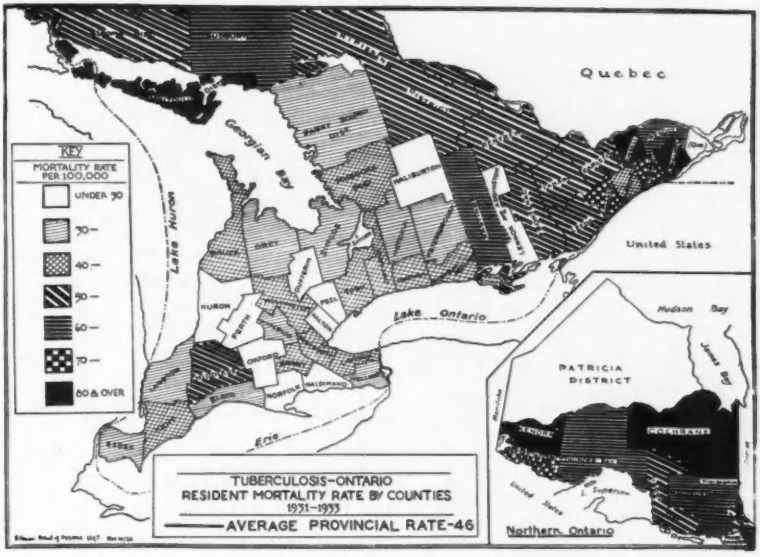
In Ontario the tuberculosis death rate in 1905 was 120 per 100,000, in 1932 it was 46, and in 1934 it was 37. The comparison of these three rates is very striking and pleasing. Let us not, however, congratulate ourselves too readily. A study of the tuberculosis situation in the world as a whole suggests that the steadily improving conditions of living and sanitation are probably the main causes of this decline. The anti-tuberculosis campaign has been an important factor but in my opinion it has had less weight than these natural causes. We may, with these reservations, congratulate ourselves that much has been done but let us realize that the most difficult portion of our task remains. Tuberculosis still kills about 1,500 persons yearly in Ontario and the great majority of these people are dying in their most productive years.

From the map of Ontario showing the death rates in various counties, it

*Presented before a joint session of the Canadian Public Health Association, the Ontario Health Officers' Association, the Canadian Tuberculosis Association and the Canadian Social Hygiene Council during the National Health Conference, Toronto, June, 1935.

†Dublin, Louis I.: Important Factors in the Decline of Tuberculosis. Report of the National Tuberculosis Association, New York, 1929.

will be noted that the higher rates are in the eastern and northern parts of the province. I think we may safely say that the various factors which have tended to reduce tuberculosis mortality have been least active in these counties. In these rural districts the standard of living has not improved as it has in the remainder of the province. Sanitation has advanced but little. Food and milk inspection is lacking. Health education has not reached these people. Tuberculosis is not discovered in its early stages and open cases are allowed to remain in crowded households. Clinic consultation and sanatorium facilities are beyond easy reach. Patients from these districts cannot afford or are reluctant to go long distances for advice and treatment.



TUBERCULOSIS—ONTARIO.

Resident Mortality Rate by Counties, 1931-1933.

A concise summary of the situation is presented in the following three tables which have been prepared by Dr. G. C. Brink, Director of the Division of Tuberculosis Prevention for the Province of Ontario, and which clearly show that tuberculosis takes the greatest toll of any disease among adolescents and young adults.

From table I the fact is clearly shown that tuberculosis kills more than twice as many people of 15 years of age and over than the group of communicable diseases of childhood, acute intestinal infections, syphilis and its sequelae, and the other diseases enumerated in the table.

In table II tuberculosis greatly exceeds as a cause of death in the age group from 15 to 35 years of age all other communicable diseases, including pneumonia, bronchitis and influenza.

TABLE I

DEATHS FROM TUBERCULOSIS (ALL FORMS) AND CERTAIN COMMUNICABLE DISEASES
By Age-Groups—Ontario, 1932

Age Groups	Certain* Communicable Diseases	Tuberculosis All Forms
0–4	404	76
5–9	88	32
10–14	35	32
15–19	37	130
20–29	26	197
30–34	25	169
35–39	42	121
40–44	44	126
45–49	47	92
50–54	67	127
55–59	45	85
60 and over	200	227
Total.....	1099	1604

*Typhoid fever, paratyphoid, undulant fever, measles, scarlet fever, whooping cough, diphtheria, erysipelas, meningitis, poliomyelitis, syphilis and sequelae, tetanus, septicaemia (not puerperal), other infectious and parasitic diseases.

TABLE II

DEATHS FROM TUBERCULOSIS (ALL FORMS) AND FROM COMMUNICABLE DISEASES
By Age-Groups—Ontario, 1932

Age Groups	Communicable Diseases Included in Table I	Acute Respiratory*	*Total*	*Tuberculosis All forms*
0–4	404	831	*1235*	*76*
5–9	88	60	*148*	*32*
10–14	35	51	*86*	*32*
15–19	37	60	*97*	*130*
20–24	39	59	*98*	*190*
25–29	26	64	*90*	*197*
30–34	25	90	*115*	*169*
35–39	42	108	*150*	*121*
40–44	44	119	*163*	*126*
45–49	47	130	*177*	*92*
50–54	67	150	*217*	*127*
55–59	45	178	*223*	*85*
60 and over	200	2142	*2342*	*227*

*Pneumonia, bronchitis and influenza.

In table III the importance of tuberculosis as a cause of death is indicated by the fact that it causes more deaths under 30 years than are occasioned by heart conditions, cancer, and pregnancy together.

So far we have considered only those who have died of tuberculosis. The extent of our problem would be better defined if we were able to say how many persons in this province are suffering from tuberculosis. Various factors have been used to estimate the tuberculosis morbidity. The figure which seems most applicable to Ontario is that obtained from the survey made in Cataraugus County, New York. This county has a mixed rural and urban

population very similar to that of central Ontario. After careful examination of more than one-third of the population, these observers concluded that there were three cases of active tuberculosis in every thousand of the population. Applying this figure to Ontario, there would be about ten thousand active cases.

To outline the problem fully we should include the potential cases, *i.e.*, those in contact with open cases. The Department of Health has kindly reviewed case records for me and has given the number of contacts per active case as three. If we multiply our estimate of ten thousand active cases by this figure we may place our potential cases at thirty thousand. I believe that this number is conservatively low. I have not taken into consideration the fact that about 50 per cent of the cases admitted to sanatorium give no history of contact.

TABLE III

DEATHS DUE TO TUBERCULOSIS (ALL FORMS) AND DEATHS DUE TO HEART DISEASE, CANCER, AND PREGNANCY (INCLUDING ALL COMPLICATIONS)
By Age Groups—Ontario, 1932

Age Groups	Heart Disease (all forms)	Cancer	Puerperal Conditions	*Total*	*Tuberculosis*
0–4	9	12		*21*	*76*
5–9	14	4		*18*	*32*
10–14	26	4		*30*	*32*
15–19	43	17	27	*87*	*130*
20–24	51	16	56	*123*	*190*
25–29	57	24	80	*161*	*197*
30–34	84	47	76	*207*	*169*
35–39	119	103	67	*289*	*121*
40–44	172	170	32	*374*	*126*
45–59	280	235	5	*520*	*92*
50–54	365	343		*708*	*127*
55–59	490	423		*913*	*85*
60 and over	4964	2425		*7389*	*227*

With this general summary of the extent of tuberculosis in Ontario, let us consider the anti-tuberculosis campaign in the province. Perhaps the best method of approach is to recall the aims of this campaign and then to ask ourselves how far we have attained our objectives.

Our aims are the reporting of all cases of tuberculosis, discovery of cases at an early stage, sanatorium treatment, the establishment of preventoria, adequate supervision of those returning or remaining at home, and education of the public as to the nature of the disease.

Case Reporting

I almost feel that this should be passed over as the situation seems so hopeless. This measure was instituted some years ago with the expectation that eventually all known cases of tuberculosis would be reported. I have not the figures for Ontario but let us take those of New York State where registration has been in force since 1897. In 1924, 14 per cent of those dying of

tuberculosis were not reported and 31 per cent were reported after death. Thirty-one per cent were reported less than one year before death and 24 per cent were reported one year or more before death. That means that the net spread by this efficient health department, when analyzed, proves to be far from effective. The net we have been able to spread in Ontario presents much larger holes. I feel that physicians are lax in reporting their cases because nothing constructive was done when the cases were reported. The general practitioners see no benefit to themselves or to their patients and they are not particularly interested in the statistical value of these reports.

Finding Early Cases

The anti-tuberculosis campaign was begun with the belief that one of its results would be the discovery of an increasing number of early cases. If we apply such a measure to the effectiveness of our campaign we at once reveal that it is seriously inadequate. From sanatorium reports of 1933 I have collected 1,098 cases. Their condition on admission, in round numbers, was minimal 15 per cent, moderately advanced 40 per cent, and far advanced 45 per cent. It is obvious that the percentage of minimal cases has risen very little during the past twenty years. These figures mean that our case-finding methods, which have been dependent on the education of the public and the medical profession, have fallen far short of the ideal.

We should realize that we cannot educate the public to recognize in themselves the symptoms of early tuberculosis. In really early disease there are no symptoms, or such vague and indefinite symptoms that they are overlooked. We should also recognize that the physician cannot detect the majority of early lesions by physical examination. He will miss many unless he uses the x-ray. This is particularly true of the childhood type of tuberculosis.

Modern case-finding consists of tuberculin testing, x-ray (radiography and fluoroscopy), physical examination and laboratory testing. The services which are now provided are as follows:—

The Division of Tuberculosis Prevention of the Department of Health operates a travelling clinic composed of two clinicians and one technician, using portable x-ray equipment. They hold clinics in various parts of the province, chiefly in those districts not reached by the sanatorium clinics. This clinic does most excellent work in diagnosis and recommendations for treatment. The personnel of this department is so limited that they cannot, at present, do more than demonstrate what ought to be done on a larger scale.*

The various sanatoria throughout the province hold clinics in their immediate vicinity. Their influence is felt chiefly in central and western Ontario. The money for this out-patient work comes from the sanatorium funds. In the clinics held outside the institutions x-ray facilities are limited or entirely lacking. The sanatoria cannot afford to operate travelling x-ray units and the various municipalities have not been willing to pay for adequate x-ray examinations. This means that these clinics are working under a very serious handicap.

*Four additional clinics are being provided by the department, two of which have been organized as this issue goes to press.

In the larger cities chest clinics are operated by the general hospitals. The expense of the work is borne by the hospital.

It is to be regretted that these various case-finding agencies are not related except by a common interest. Each group carries on as it sees fit without any organized correlation with the work of other clinics. No uniform reports or statistics are kept and no detailed reports are made to the director of the provincial clinics. This lack of unified effort means that we are waiting for patients to come to us instead of seeking them among the apparently healthy. Contacts of open cases of tuberculosis are not systematically examined.

Summarizing our situation, our case-finding machinery is not effective in terms of early cases discovered, partly because of lack of personnel and partly the lack of x-ray facilities, but largely because we have followed no organized plan of campaign.

Sanatorium Treatment

Thirty years ago our first and great cry was for beds and more beds. Our goal at that time was the provision of one bed per death. It was soon found that this number was not enough. More beds were needed as the knowledge of the beneficial results of sanatorium treatment was carried back home by discharged patients. Various philanthropic lay organizations responded nobly to our call and it is through their efforts that we now have 1.7 beds per death. The central and western parts of the province are well cared for; one hundred new beds have just been provided by the new sanatorium in Fort William. This institution should look after the needs of the north-western districts. There is need for a hospital of seventy-five to one hundred beds to serve the eastern counties.

At the present time all our sanatoria have waiting lists during the winter months and empty beds in the summer. A survey recently made of the number of beds in general hospitals in the province shows that there are, at all times, over one thousand vacant hospital beds. Dr. W. J. Dobbie in his paper, "A Provincial Program for the Control of Tuberculosis", discusses the significance of these facts.* A classification of the bed capacity of sanatoria in Ontario is presented in table IV.

TABLE IV

CLASSIFICATION OF BED CAPACITY OF SANATORIA IN ONTARIO

	Adults	*Children*
Brant Sanatorium, Brantford	50	54
East Windsor Sanatorium, East Windsor	37	17
Muskoka Hospital for Consumptives, Gravenhurst	440	..
St. Mary's on the Lake, Haileybury	115	..
Mountain Sanatorium, Hamilton	520	80
Freeport Sanatorium, Kitchener	105	20
Queen Alexandra Sanatorium, London	570	30
Royal Ottawa Sanatorium, Ottawa	153	35
Niagara Peninsula Sanatorium, St. Catharines	85	..
Essex County Sanatorium, Sandwich	75	56
I.O.D.E. Preventorium, Toronto	..	116
Toronto and Queen Mary Hospital, Weston	479	64
	2629	472

*The JOURNAL, *26*: 494, 1935.

Not only have sanatoria increased in size but the type of construction has changed. From the primitive building, in which patients largely took care of themselves, has emerged the modern sanatorium which is as fully equipped and staffed as a general hospital. The splendid results of collapse therapy have increased the demand for institutional care.

Pneumothorax and phrenic nerve surgery are indicated in from 70 to 80 per cent of cases and are best carried out in an institution. Thoracoplasty is found necessary in about 3 per cent of the patients. It is our hope that the more prompt application of surgical treatment will lessen the period of sanatorium residence and make existing beds available to more patients. Many cases are kept over long periods in sanatoria because they are unable to work and have no home. There are no institutions in the country in which these semi-invalids can be cared for. They, of course, occupy beds which might well be filled by those in more immediate need of treatment.

Pneumothorax patients can be, and are discharged while still in need of refills. The sanatoria and hospital clinics are now doing this work but the number of pneumothorax out-patients is rapidly increasing and the work is becoming quite a burden. In Queen Alexandra Sanatorium in London, one member of the staff spends four afternoons weekly giving out-patient refills.

Preventorium Treatment

When preventoria were built the belief was that by treating infected children one would prevent the development of tuberculosis in later life. Further experience and study have given us a different conception of the development of tuberculosis. We believe that there are two types of response to infection by the tubercle bacillus—one to the original or primary infection and one to a second inoculation or reinfection. The first reaction is one of prompt exudation with subsequent complete, or almost complete absorption. Little tissue destruction takes place. The infected child is, however, rendered allergic to reinfection. Reinfection calls forth a different response, namely, exudation and tubercle formation which lead to tissue destruction and all the tissue changes resulting from attempts on the part of the body to repair the damage.

The tuberculosis mortality for infants under eighteen months of age is about forty-five per 100,000 infants. This is a higher death rate than that for diphtheria, scarlet fever and measles together in this age group. Such a high rate means massive infection which can come only from human or bovine sources. It also means that we have done a poor job in breaking contact. The preventorium does not enter this field.

From the ages of two to fourteen the number of children infected rises rapidly but the number of cases of active tuberculosis rises but little. These are the children found in the preventorium. They have recovered from a primary infection and if the source of their infection is removed they are unlikely to develop further disease until they are past preventorium age. Such care and supervision as they require can, with the proper organization, be given in the home. A large proportion of the children in preventoria have survived a primary infection. Treatment of these children benefits the indi-

vidual but has little effect in the larger field of tuberculosis control. After the age of fifteen the tuberculosis death rate rises rapidly. No figures can be produced to show that preventorium treatment has altered this part of the mortality curve.

To summarize, no concerted effort is being made to reduce the tuberculosis mortality in infants, nor are we devoting particular attention to the adolescents in whom tuberculous disease is particularly menacing.

Home Supervision

Except in some of our larger cities very little is being done to care for the tuberculous, either before or after sanatorium treatment. All sanatoria are forced to keep certain patients for long periods because there is no other place to send them. There are many of these semi-invalids who could be cared for at less cost if suitable accommodation existed. Many patients who have made a reasonable recovery are forced to return to poor homes and unsuitable work. The consequent relapses are frequent and costly. These are problems of social readjustment with which we have not yet been able to cope.

CONCLUSIONS

In drawing the following conclusions I do not wish to leave the impression that our campaign against tuberculosis has been without result. I think that we may say that we have met the pressing needs of the past extremely well.

1. Case reporting, as judged by the results obtained in this province, has been a failure.

2. Our case-finding machinery has not yielded increasing numbers of early cases. Our future efforts should be better organized.

3. An institution of about one hundred beds is needed to serve the eastern counties. Some of our existing accommodation will need rebuilding in the near future to bring it into conformity with our ideas of modern treatment.

4. There are sufficient beds for the institutional care of tuberculous children. Our future work should follow broader and more fruitful channels.

5. Much remains to be done to care for the tuberculous in their homes and to rehabilitate patients discharged from sanatorium.

A Provincial Program for the Control of Tuberculosis*

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IF one were to consider only the reduction in the mortality rate from tuberculosis in any province—for instance in Ontario, from 180 per 100,000 in 1900 to 41.6 per 100,000 in 1933—or if one were to contemplate merely the various anti-tuberculosis activities at present in operation—such as sanatoria, stationary, extension, and travelling diagnostic clinics, public health nursing, welfare agencies, organized municipal departments of health, and educational publicity by public and voluntary agencies—one might readily conclude that excellent progress has been made in the campaign against this disease. And indeed such a conclusion would be altogether warranted. One need not in any way seem to minimize or depreciate these admirable results and achievements when one ventures to suggest that something more is now required if further progress is to be made in reducing the mortality, morbidity, and infection rates from this disease.

Doubtless there are certain irreducible minima for these rates, beyond which it will not be possible, with our present knowledge and equipment, to advance; but there are not many who would claim that such irreducible minima have as yet been reached in any of the provinces of Canada.

It is, of course, common knowledge that in any campaign it is the last 10 or 20 per cent of the objective that is the most difficult to attain. So further to reduce the loss—in lives, in money, and in happiness—resulting from tuberculosis it is necessary not only to devise new methods and new measures of attack, but also to use more efficiently the equipment and the knowledge which we already have.

Doubtless there may be some who are unwilling to concede the point that the knowledge, the equipment, and the facilities which are at our disposal are not being used as completely and as efficiently as is possible. The citation, however, of a few examples may serve to demonstrate that this contention is not far from correct.

It is not creditable in these days that there should be medical officers of health in Canada who do not learn of the existence of cases of tuberculosis until informed by the filing of certificates of the registration of deaths. This condition must be charged in the first instance to the failure of the general practitioners to diagnose cases or to report them when they have been diagnosed. Sometimes, on the contrary, the reason given by the family physician for neglecting to report diagnosed cases is that from experience he has found that the medical officer of health never shows any interest, never takes any

Presented before a joint session of the Canadian Public Health Association with the Ontario Health Officers' Association, the Canadian Tuberculosis Association, and the Canadian Social Hygiene Council during the National Health Conference, Toronto, June, 1935.

action, nor offers any help in having done what ought to be done in the circumstances. So what is the use of reporting the cases? Nevertheless, whatever may be the reason for the lack of co-operation, it is obvious that there is lack of efficiency wherever these conditions obtain. There should be in the office of every medical officer of health, in city, town or township, a system of record keeping such that there can be found at a moment's notice:

(*a*) The known cases of tuberculosis—with names and addresses, type of case, names of contacts, etc.;
(*b*) Names of known cases under observation: (1) by private physicians, (2) by clinics;
(*c*) Names of known cases not under observation;
(*d*) Names of known cases in sanatoria or hospitals;
(*e*) Names of known cases discharged from sanatoria with information in each case as to the physical and social condition; and
(*f*) Names of contacts of deceased tuberculosis persons.

The mere recording of these names, however, is of little value in itself. The reporting and recording of cases of tuberculosis must have as its objective the saving of lives and the protection of other persons from infection.

And so again it is not creditable in these days that there are municipalities in which, even when diagnosed cases have been reported, no effort is made either (1) to separate the diagnosed case from contact with others in the same house or (2) to have the known contacts subjected to investigation. Should not both of these things be done by the family physician or by the medical officer of health, separately or conjointly?

It is, of course, a matter of some concern that all medical students are not being sufficiently trained to enable them confidently to diagnose minimal lesions of tuberculosis, but it is not too much to expect that every medical officer of health should be able to direct any family physician as to the methods that should be used in such a case-finding survey.

When by means of the tuberculin test, using a standardized tuberculin—a test requiring a simple technique very readily learned, it is possible to separate all contacts into two classes, namely (1) those that have been infected and (2) those that have not been infected; when by means of an x-ray those who have been infected can be again divided into (1) those that have no more than a primary lesion and (2) those that have more than a primary lesion; when there are available clinics at which those who have more than a primary lesion can be specially investigated; when by these simple procedures definite information can be readily obtained, it is to be deplored that there should be any practitioner or any medical officer of health neglecting to make use of them.

But once more it is not creditable in these days that after cases have been diagnosed and reported there is hesitation, on the part of the family physician or the medical officer of health, to suggest that hospital or sanatorium treatment be provided when indicated, because of a reluctance on the part of the muncipal officers to incur the expense of maintenance charges, even when these are, as a rule, only about one-third of the actual cost.

At this point it must be emphasized that a most important place in any anti-tuberculosis campaign is that occupied by the family physician. The family physician, however, finds himself in difficulty because of the financial condition of the patient, or the financial condition of the municipality, or the lack of sanatorium accommodation in his district, or, finally, because of apathy on the part of the medical officer of health, the local board of health or the municipal council. He is not, therefore, always deserving of blame.

These examples would seem to be sufficient to indicate that there is not yet that degree of efficiency in the use of the available methods that is desired. When such conditions obtain, is it any wonder that in Canada there are still, as recorded for 1933, 6,925 deaths in a year, some 8,210 cases in sanatoria, and probably more than 26,400 other cases from which come the infections that will keep up the mortality, morbidity and infection rates for years to come.

What can be done about it all in any province? To anyone who has given the matter reasonable consideration it would appear to be obvious that what is required most, at the present time, is some unification of the different activities, some central direction to the end that the most may be made of the facilities already available.

It would seem that there should be, in connection with the provincial departments of health, a division of tuberculosis under the guidance of a director whose duty it would be to stimulate, unify, and harmonize all the activities of the province, whether they be municipal or voluntary. There need be no idea of absolute uniformity, but there should be such co-operation as would harmonize individual efforts with a predetermined aim so that the present inefficiency in the use of available facilities might be eliminated.

It is difficult, at the moment, to state with any degree of definite detail just what such a director and his staff might be expected to accomplish. Only in the barest outline can his field of usefulness be envisaged. The range of his activities would grow and alter as the need became apparent or as new problems presented themselves from time to time.

There are, however, many lines of activity that immediately suggest themselves. In any community anti-tuberculosis program there are six major features to be stressed, namely, general health education, diagnostic facilities, public health nurses, case-finding, institutional treatment, and rehabilitation and follow-up. In how many municipalities have all of these been featured? Very few indeed. In how many has none of them been featured? I am afraid it will have to be admitted that there are many.

The director following such an outline could very well make a beginning by stimulating the general practitioners to a greater interest in the problem of eradicating tuberculosis from the local community. For this work many general practitioners need help. They need instruction in the diagnosis of tuberculosis. Particularly do they need information as to the place the tuberculin test now takes in the investigation of contacts. They need a few demonstrations of the technique used in making this test. They need to know what the procedure is with negative reactors and with positive reactors. The general practitioners need also the help which the nearest general hospital ought to be able to give by providing facilities for those methods used in

diagnosis which the average physician cannot provide in his own office; namely, (1) the tuberculin diagnostic test; (2) x-ray—fluoroscope, films, and interpretation; and (3) examination of sputum. If the department of health, provincial or municipal, would provide these facilities, even at a nominal charge, general practitioners would be able to bring to light many early cases that are now unknown.

The director could see that the problem of tuberculosis was clearly put before the physicians of the province. Bulletins sponsored by the medical associations, welfare agencies, insurance companies, etc., and sent to each physician in the province at intervals would be a most effective means of keeping them in touch with the latest developments. How many physicians to-day could tell you how their county or city or town stands as regards mortality from tuberculosis? Do you know that county A has a mortality rate just twice that of county B? Do you happen to know whether your city has the lowest or the highest mortality rate among Canadian cities? Yet all of this information is available and could be furnished to any local group and it rather stimulates activity—whether your town happens to be the best or the worst.

The director could also stimulate the medical officers of health. Are there any of these here who feel that they are already doing all that they might do, not to say anything at all as to all that it is desirable that they should do? If the medical officer of health is already encouraging the notification of diagnosed cases, providing for the investigation of home conditions and the examination of contacts, securing the hospitalization of active cases whenever necessary, arranging for the disposal and supervision of cases after the term of sanatorium treatment has been completed, providing for the general practitioner the special diagnostic facilities previously mentioned, and keeping in his office records that will show at once all the known cases and contacts in his area, with names, addresses, physical and social condition; if the medical officer of health is already doing these few things and doing them well and thoroughly day by day, the director will have little to do except to congratulate him, and point to him as an example of what a medical officer of health should be in so far as the subject of tuberculosis is concerned.

When the director has adequately dealt with the general practitioners and with the medical officers of health, he might, with advantage, deal with the subject of diagnostic clinics, stationary and travelling. At the present time, in a number of provinces, these excellent activities are doing a valuable piece of work, each in its own way, but the value of the total work done is not nearly so great as it would be if there were more uniformity of record and more co-ordination of results by a central office.

In the matter of uniformity of records there should be some classification of cases to segregate:

(1) Definitely non-tuberculous cases;
(2) Contacts—(*a*) requiring supervision, (*b*) not requiring supervision;
(3) Suspects—requiring follow-up work, further investigation, and repeated examination;

(4) Active cases—who should be under active treatment somewhere;
(5) Chronic cases—who should be known, and whose place of residence should be known, but who do not require re-examination except for some special reason.

In connection with clinics there are other matters requiring adjustment. Who should do the follow-up work? The municipal department of health? The clinic? The sanatorium? Who should bear the cost? Sanatoria are now doing a great deal of this work free of charge. It is a question as to whether or not they can continue to do so.

It would not be appropriate to discuss the details of these or other clinic problems at this time. It should be apparent, however, that the director of the division of tuberculosis would have a large field for important work in bringing into an organized and harmonious system all the diagnostic clinics of a province, whether they be provincial, municipal or voluntary.

To the sanatoria of the province the director could act in the capacity of friendly adviser. He might also gather information as to the actual needs for new sanatoria or additions to those already established. Accepting, for the moment, the estimate that there should be $2\frac{1}{2}$ beds for each death per year, it is not difficult to say just how many beds a province requires. Nor is it very much more difficult to determine in what part of a province new or additional beds are required. Information as to the deaths in each county can be had and from this information the locality showing the greatest need may readily be determined.

The Importance of the Home

The sanatoria are not more important than are the homes. The home is the place at which the disease began, and it is the place from which it spreads, and it is also the place to which the patient must return to continue his treatment after his discharge from the sanatorium. It is a question that might be considered by the director as to whether or not something should be done to make the home a suitable place for the patient. There may, in this problem, be a new method of attack to be developed. Certain it is that no adequate plan has as yet been devised for the proper education of the family of the person who has been sent to a sanatorium. The result is that the patient's immediate relatives are unable to devise for the patient on his return to the home a suitable environment; nor do they know enough about his disease to keep them from opposing and even ridiculing him when he tries to order his mode of life in conformity with the knowledge he has acquired. Adequate education of the family is quite as essential as is the education of the patient.

Preventoria will give the director some concern. At present the practice in some places is to care for contact children in institutions for periods varying from six months to several years. Doubtless the children derive some benefit but it is doubtful if much is gained ultimately as far as the control of tuberculosis is concerned. When the children are discharged they return to practically the same home conditions as those from which they originally came. It would seem to be much better to devote some effort to altering the home

conditions so that the child could be safely cared for in the home. An institution is an expensive place for a child not in need of medical and nursing care; and unless such children are to be cared for in institutions indefinitely it is obviously doubtful whether this method of care is giving returns commensurate with the cost. Indeed it may be questioned as to whether an institution is the best place for these children at any time, except to tide over a period of active readjustment of the home.

Assuming that a child has had heavy infection (not disease) as shown by x-ray, what is the responsibility of the anti-tuberculosis workers to this child? It is generally agreed that if the source of infection is removed and contact broken, the infection is in almost all cases well taken care of, although a potential danger does continue to exist. It is thought impossible to secure evidence that preventorium care will prevent the future development of disease. If the home is satisfactory, institutional care is not indicated. If the home is not satisfactory, is it not the duty of welfare agencies to endeavour to make it so instead of institutionalizing the children who, it is granted, are undoubtedly improved in general health after such care but on discharge return to the home in which conditions are as unsatisfactory as before the child was taken away?

It should not be assumed that children showing pyrexia of unexplained origin, some malnutrition and fatigue, are always suffering from tuberculous infection because they have been in contact with the disease and give a positive tuberculin reaction, especially if the x-ray film of the lungs shows no evidence of pathology. It would appear that children coming in the above described group might better be sent to a children's ward in a general hospital, or a hospital for sick children to have diagnostic investigation made. If this were done, it would be found that in a large percentage of such cases the symptoms were not caused by tubercle infection. The return to home life could be brought about much sooner than now takes place when these children are admitted to a preventorium.

It is generally agreed that a more careful selection of children entering preventoria is indicated and that a longer average stay than six months is not necessary. During this period more attention should be given to the bettering of the homes from which the children are taken. Moreover, defects, such as diseased tonsils, etc., should be remedied soon after admission and not left until just before discharge.

General Hospitals

The general hospitals have some responsibility in connection with the problem of tuberculosis. It is a responsibility, however, which is not very seriously regarded.

It is probably safe to say that in the province of Ontario there are about 1,000 vacant beds in the general hospitals on any one day. It has often been suggested that some of these vacant beds should be used for cases of tuberculosis. Little headway, however, has been made in putting such a plan into operation.

In 1916 the National Tuberculosis Association of the United States recommended to general hospitals that separate wards, one for each sex, should be

established for the care of cases of tuberculosis. The idea was approved by the American Medical Association in 1921 and by the Canadian Tuberculosis Association in 1928. The difficulty seems to centre around the reluctance of the superintendents of general hospitals to take action along these lines, though it would obviously be to their advantage to do so, since these tuberculous cases would assist to carry the overhead. If a nurse with sanatorium training and experience were put in charge of these wards she would very soon operate them in the same way that wards in the sanatoria are operated, and there would be no difficulty in securing satisfactory results in suitable cases not requiring special treatment, or in providing temporary care, at least, for those waiting to be admitted to a sanatorium. These vacant beds should be available for acute cases who are unable to gain immediate admittance to a sanatorium. They should also be available for advanced cases who are not able to travel long distances to reach an available bed in a sanatorium. The day should now be long past when a general hospital should attempt to claim that it is unable to care for a few cases of tuberculosis without risk to the members of its staff or to other patients.

Of course, due appreciation of the hazard of the undue retention of tuberculosis patients should be realized by all those concerned. The percentage of nurses, both undergraduates and graduates, who develop tuberculosis is materially higher than it should be in many general hospitals, even when they do not accept known cases of tuberculosis. This is because of faulty technique and unlabeled positive sputum cases. Even if a program for the care of these patients in hospitals for a certain period was in effect, provision should be made for the regular examination of all members of staff. All nurses before being accepted for training and again before graduation should be given an x-ray of the lungs to exclude tuberculosis.

The use of these vacant beds in general hospitals would make it unnecessary to provide so many new beds in sanatoria. There is also another method by which a similar economy might be brought about. Every sanatorium has a number of patients for whom all has been done that can be done. They are called "maximum benefit" cases. Yet because they have no homes, no friends, no money, and are unable to work, they cannot very easily be discharged. What they need is "board and lodging". This could be found for many of them if the municipality and the province would recognize that it would be more economical to pay for "board and lodging" in specially selected private homes than to continue to pay twice as much for mere "board and lodging" in a sanatorium. Moreover, many of these patients would be much happier away from the necessary but sometimes irritating restrictions of sanatorium life. The director could arrange for supervision of these patients and these private homes by the local department of health and he could also arrange with the superintendent of the sanatorium for the selection of suitable cases for this type of home care.

Has there been already sufficient suggestion to warrant the conclusion that there is need and scope for an active division of tuberculosis, if the facilities available are to be most efficiently used, and if there is to be any material improvement in results?

The More Extensive Use of Pneumothorax Therapy Outside of Hospitals and Sanatoria

But again it might be desirable for the director to appraise certain new forms of activity to determine their suitability for inclusion in his local scheme. For some municipalities the experience of the city of Chicago may be of interest and suggestive. The death rate in Chicago had fallen from 170.6 per 100,000 in 1915 to 65.9 in 1930. But there it seemed to many to be anchored. Every bed in every sanatorium in Chicago and vicinity was occupied, and for each there was a growing waiting list. The difficulties and the obstacles in the way of further diminution of the mortality rate were such as to demand that new methods be employed. In 1931, therefore, a plan for the use of collapse therapy outside of the hospital and the sanatorium was adopted. As a result it has been estimated that in 1934 there were 75 fewer deaths from tuberculosis than there were in 1930. More important than this is the fact that 2,000 cases, mostly open and mostly advanced, who could not be isolated in hospital or sanatorium because there were no beds available, were collapsed; and of these 42 per cent were rendered sputum-negative. These 693 carriers, mechanically isolated by collapse, must and will exercise a marked influence on the morbidity and mortality of the years to come.

Would it not be possible for such a method to be used in some of the municipalities in Canada? Would it not be a proper function of the director of the division of tuberculosis to stimulate certain local communities to provide the facilities necessary for the use of this new weapon? Is it necessary that we must continue to add the names of tuberculosis patients to waiting lists, with the full knowledge that admittance will be long delayed?

A field plan for the use of collapse therapy could be expanded to take in the majority of the known cases in the community. If 40 per cent of these can by such a method be made sputum-negative the benefit to the community, from the standpoint of a reduction in morbidity and mortality, is obvious. As Lawrason Brown has written, "It is cheaper for any community to establish 'artificial pneumothorax' clinics than to maintain patients over long periods of time in sanatoriums."

It should at least be considered if it would not be possible to use this method in some municipalities—to establish pneumothorax clinics to care for suitable urgent cases awaiting admittance to a sanatorium, as well as to care for cases that could be released from sanatoria if provision could thus be made for the continuance of the compression therapy.

The Nursing Profession

To accomplish much of all that has been outlined, it will be necessary to stimulate the members of the nursing profession in the province to a realization that they too have a part to play in this anti-tuberculosis campaign. Some special groups could be particularly useful, such as public health nurses, school nurses, Victorian Order nurses, nurses with industrial and commercial firms, and the nurses directed by the Red Cross Society in the more sparsely settled areas.

In order that this may be done, however, there must be more adequate

instruction and experience for all nurses in regard to tuberculosis, and more particularly for those who are to engage in any capacity in the public health activities of the province. It is not too much to ask that every graduate nurse should have either before or subsequent to graduation some special instruction and experience in tuberculosis if she is to have any part in the campaign against this disease. To this end it is desirable that the sanatoria of the province should undertake to give adequate courses so that nurses trained in general hospitals may have such instruction and experience either before or after graduation. The sanatoria owe this contribution to the education of the nurses of the province, particularly as there is at present no other way in which this instruction and experience may be had. Each sanatorium should have an adequate number of graduate nurses competent to instruct those who come to avail themselves of the course provided. It is desirable also that sanatoria should not continue the practice of using "practical nurses", or "partially trained nurses" unless they designate them as "nurses-in-training" or "ward aides."'

As far as tuberculosis is concerned the present training of public health nurses is inadequate. There is little or no opportunity for practical experience, since there are few places where the essential and desirable practical experience can be had. Not only should the subject matter of the teaching be modern, but the essential case-finding procedures should be stressed, as well as the details of modern record-keeping. Without all these things a nurse is of little value to a medical officer of health, to a commercial or industrial firm, or to a community.

There should also be more importance given to the subject of co-operation between the medical practitioner and the public health nurse. At present it is the exception rather than the rule for the general practitioner to realize the valuable assistance that can be given him through such nursing service, and too often also the nurse has not been taught how best to approach and work with the family physician.

Statistics

Finally the division of tuberculosis could compile statistics that would be informative to different individuals and groups and would be useful for purposes of publicity or providing incentive. Such statistical data have been compiled by Dr. G. C. Brink, Director of the Division of Tuberculosis Prevention in Ontario, and made available. To Dr. Brink the writer is under obligation not only for these data but also for valued information bearing on the whole problem of tuberculosis.

In Dr. Crombie's paper* the importance of tuberculosis as a cause of death is shown by several tables presenting the deaths from certain communicable diseases and from heart disease, cancer and other important causes. It is by such statistical comparisons that the problem of tuberculosis is visualized. Dr. Brink has supplied the following tables which present the tuberculosis situation as indicated by mortality returns in the various counties as well as in the larger cities and towns in Ontario.

*This Journal, **26**: 486, 1935.*

TABLE I

RESIDENT TUBERCULOSIS MORALITY RATES
CITIES AND TOWNS
Ontario, 1931-1933

Cities and Towns	Estimated Population 1933	Average Mortality Rate per 100,000
Cornwall	11,462	103.9
Timmins	17,436	90.7
Sudbury	17,246	86.7
Fort Frances	5,279	82.3
Belleville	13,899	79.1
Kenora	7,218	75.1
Pembroke	10,132	74.6
Eastview	6,719	74.4
Trenton	6,241	69.2
Brockville	9,818	68.4
Port Arthur	19,459	67.0
Guelph	20,882	66.7
Whitby	5,281	63.9
Kingston	23,768	63.5
Cobourg	5,780	63.3
Hawkesbury	5,343	63.2
London	73,880	63.2
Lindsay	6,979	60.9
Smiths Falls	7,517	58.1
Renfrew	5,219	56.7
Fort William	24,492	56.5
Ottawa	135,300	56.4
Toronto	623,562	52.5
Port Colborne	5,680	51.7
Kitchener	31,324	51.5
St. Thomas	16,066	48.8
Brantford	30,691	48.6
Brampton	5,487	48.3
North Bay	15,925	47.2
Oshawa	22,506	46.8
Sarnia	17,645	46.8
New Toronto	7,861	44.9
Stratford	17,456	44.8
Windsor	62,216	43.9
Owen Sound	12,923	41.4
Chatham	16,284	40.8
Welland	10,585	40.7
Sandwich	10,682	40.2
St. Catharines	26,394	39.9
East Windsor	14,606	37.4
Sault Ste. Marie	23,382	35.7
Peterboro	22,869	35.2
Mimico	6,733	34.6
Fort Erie	5,344	34.6
Barrie	7,725	34.3
Niagara Falls	18,060	34.1
Dundas	5,032	33.1
Thorold	5,068	33.1
Hamilton	154,276	32.7
Orillia	8,426	32.3
Preston	6,274	31.9
Ingersoll	5,104	26.8
Waterloo	8,746	23.4
Collingwood	5,536	23.2
Woodstock	10,968	17.8
Simcoe	5,317	15.6
Walkerville	9,968	11.8
Midland	6,925	9.6
Leamington	5,004	0.0

TABLE II

RESIDENT TUBERCULOSIS MORTALITY RATES
BY COUNTIES (Including Cities and Towns)
Ontario, 1931-1933

County	Estimated Population 1933	Average Mortality rate per 100,000
Manitoulin*	10,924	137.1
Kenora	22,554	98.9
Glengarry	19,030	89.9
Russell	19,030	85.4
Cochrane	59,556	80.0
Rainy River	17,972	79.6
Grenville	16,915	78.6
Stormont	33,478	72.9
Timiskaming	38,059	69.3
Sudbury	59,908	66.1
Prescott	25,372	64.3
Thunder Bay	66,956	62.2
Hastings	60,613	62.1
Prince Edward	16,915	59.2
Frontenac	46,869	58.3
Nipissing	42,288	57.5
Algoma	47,574	57.4
Middlesex	121,578	56.8
Renfrew	53,564	52.9
Carleton	174,790	51.1
Lanark	33,830	51.1
Leeds	36,297	50.5
Wellington	59,556	49.2
Kent	64,489	47.1
Muskoka	21,496	47.1
Durham	26,430	46.0
York	879,943	45.2
Bruce	43,345	44.4
Brant	54,974	44.3
Dundas	16,563	43.0
Ontario	61,318	41.4
Northumberland	32,421	40.6
Lincoln	55,679	40.1
Wentworth	195,230	40.0
Lambton	56,032	39.7
Welland	84,928	38.2
Parry Sound	26,430	38.1
Essex	164,218	36.5
Waterloo	92,329	35.2
Grey	59,203	34.2
Elgin	44,755	34.1
Peterboro	45,107	33.7
Simcoe	85,986	33.0
Victoria	26,430	30.6
Halton	27,135	29.7
Huron	46,517	28.4
Peel	28,897	28.0
Haldimand	21,849	27.7
Perth	52,862	26.9
Dufferin	15,153	26.5
Norfolk	32,068	25.2
Oxford	48,984	21.7
Lennox & Addington	19,382	19.1
Haliburton	5,991	0.0

*Presence of a large Indian population.

Dr. Brink has supplied also an interesting estimate of the cost of tuberculosis in Ontario in 1933 and 1934.

TABLE III

COST OF TUBERCULOSIS IN ONTARIO

	1933	1934
Financial assistance given by the Government to sanatoria (75c per day per patient)*	$ 670,766.82	$ 738,397.54
Paid by municipalities for the maintenance of patients in sanatoria ($1.50 per day per patient)	1,215,663.00	1,293,719.09
In 1933 tuberculosis was responsible for placing on the list of the Mothers' Allowance Commission 985 families, representing 13 per cent of the total allowance paid during the year; and in 1934, 980 families, or 13.3 per cent of the total allowance	360,151.00	400,000.00
Total cost to the Provincial Treasury and the municipalities	$2,246,580.82	$2,432,111.63
Paid by patients towards their own maintenance	354,199.07	293,130.16
Total cost of tuberculosis†	$2,600,779.89	$2,725,246.79

*Included in the total for 1933 is $25,815.25 for patients from the unorganized territory ($2.00 per day per patient); and in the total for 1934, $30,871.51.

†These figures do not include the amount paid by the sanitoria, over receipts, to provide Depreciation Reserve. This cannot be definitely calculated.

The amount expended by the Provincial Treasury and the municipalities for the care of tuberculous patients in general hospitals cannot be ascertained. Considering that there were several hundred such cases treated in general hospitals for periods varying from a few days to the entire year, it will be appreciated that a very considerable sum was expended for this purpose. Neither can the cost of maintenance of patients treated in their own homes be estimated. Further, the cost of tuberculosis arising indirectly out of industry is not included. One may conclude that the direct cost of tuberculosis is considerably over $3,000,000.00 per year. If one considered the loss in wage-earning power and production, the cost to the province because of tuberculosis would amount to several million dollars annually.

If the present mortality, morbidity and infection rates are to be reduced there must be an organized effort to utilize every available means to ensure that

(1) Each case of tuberculosis be traced to its source.
(2) Each case be properly treated.
(3) Each source of infection be isolated, by one method or another.
(4) All contacts be investigated.
(5) All contacts who have been infected be safeguarded.

Both old and new methods should be put into operation; and to have such a plan work efficiently there is need for central direction from a director of a division of tuberculosis in the provincial department of health.

There is indeed much truth in the words of John A. Kingsbury: "Thirty or fifty years ago the primary problem was lessening the gross ravages of tuberculosis. To-day the major task is eradicating the last vestiges of a reduced

and partially controlled plague. . . . The extensive method of the broad campaign is largely outworn; the intensive method of the sharp and pointed campaign is full of promise."

The measures that have been demonstrated by experience to be of value have been conveniently summarized in the Bulletin of the Canadian Tuberculosis Association for March, 1935:

1. Early education of the people as to the problem and the needs for control; the early symptoms; the value of prompt treatment, and how tuberculosis can be prevented in other members of the family and associates.

2. General facilities for the diagnosis of the disease; adequate clinics generally available in all parts of the country where general practitioners may refer all patients suspected of having tuberculosis, on the first symptoms.

Examination and supervision of all persons, both children and adults, who have been associated with the disease.

3. Treatment beds available for all patients suffering from tuberculosis.

4. Adequate financial arrangements whereby all tuberculous patients may have treatment without delay once a diagnosis is made. Previously they may have remained at home and infected other members of the family before action was taken.

5. Adequate supervision, on discharge from sanatorium, by review examinations and visits by public health nurses.

6. Social service, to ensure that the family is taken care of during the absence of the patient and that the patient is adequately taken care of after discharge from sanatorium until he is able to work again, if work is available.

7. Some provision for carrying surveys of special groups—nurses, normal students, university students, groups in industry—and fostering the idea of periodic medical examination of all our people.

EDITORIAL SECTION

ACTIVE IMMUNIZATION AGAINST DIPHTHERIA

THE two papers appearing in this issue dealing with the response to diphtheria antigens in man have touched upon certain problems of immunity. In so far as the broad and fundamental aspects of immunity are concerned there is no claim to novelty. The importance of the secondary stimulus demonstrated in 1899 by Dean, and by Cole in 1904, and later studied in great detail by Glenny and Südmersen in the case of diphtheria toxin, has long been established. The important and practical problem, however, of the choice of diphtheria antigens and their use has been indirectly raised; more particularly in so far as alum-precipitated toxoid is concerned.

Although Roux and Yersin as early as 1889 had used potassium alum in attempts to purify diphtheria toxin, it was not until 1926 that the suggestion was made by Glenny and his associates of using the precipitate formed by the addition of alum as an immunizing agent. It was shown that two toxoids to which 0.4 per cent and 0.8 per cent alum had been added were much better antigens for guinea pigs than were the toxoids in their unmodified form. In 1930 Glenny described the use of toxoids precipitated with from 0.1 to 2 per cent alum and showed that in guinea pigs and in horses the antitoxin produced after the injection of the precipitated toxoid was greater than when unmodified toxoid of equal Lf value was used. In the next year the observations were extended and Glenny made the statement, "There appears a possibility of obtaining a product which, in a single injection, will immunize beyond the Schick level of immunity." Saunders in 1932 and 1933 compared alum-precipitated toxoid given in three doses with toxoid-antitoxin similarly used. With the former preparation eighty-one per cent of persons, previously Schick positive, became Schick negative as compared with sixty per cent with the latter. With an increased percentage of alum the percentage of those showing induration was increased. With two per cent alum, three per cent showed induration; with nine per cent, fifteen. It is not indicated in the British literature that the use of alum-precipitated toxoid has been extensive. Alum-precipitated toxoid, however, has been widely employed in the United States following the reports of Wells, Graham and Havens in 1932, and of Baker and Gill in 1934, McGinnes, Stibbens and Hart and others.

Laboratory investigators are in full agreement that alum-precipitated toxoid is superior as an antigen to unmodified toxoid when administered in one dose in guinea pigs. There is much evidence to be found in the American literature to show that one dose of alum-precipitated toxoid will render a high percentage of previously Schick positive persons Schick negative. Fraser and his associates have, on the other hand, compared the response in antitoxin, as measured by intradermal tests in rabbits, in the serum of persons receiving one dose of alum-precipitated toxoid with the response to three doses of unmodified toxoid, using in their study the same original batch of toxoid. The children comprising the group for this experiment were carefully selected. Only those who were non-reactors to toxoid (Moloney test, negative) and whose serum was shown initially to have no antitoxin ($<1/500$ unit) were chosen for the purpose of comparing the response to the two antigen preparations. It should be emphasized that this study has not been concerned with the very important problem of the choice and dosage of a diphtheria antigen for active immunization. In coming to a decision in that regard there are many considerations which the authors have, we think wisely, discreetly avoided. Their conclusion, however, is definite in emphasizing that one dose of alum-precipitated toxoid, under the conditions of the experiment, does not elicit as good an antitoxin response in humans as will three doses of unmodified toxoid. The Schick test is shown to be entirely inadequate as a measure of the comparative antigenic response.

The question will be raised as to whether it is ever necessary or even desirable to immunize beyond the Schick level. The dictum, "once Schick negative, always Schick negative", is dangerous because it is fallacious. The suggestion that persons once rendered Schick negative are immune to diphtheria is one that is not easy either to substantiate or to refute. The response to a secondary stimulus is so rapid and has been so well demonstrated in studies in diphtheria and tetanus immunity that one is tempted to assume that the mechanism once attuned will respond in a manner adequate for the protection of the individual in the event of subsequent infection. The question at once arises, what constitutes an effective primary stimulus? This can in turn be answered only in terms of the degree and nature of the response to an adequate secondary stimulus. However, if the sensitivity to diphtheria protein as revealed by the toxoid reaction test (Moloney test) is a manifestation of a previous diphtheria experience, and we think it is, and if this experience may for purpose of argument be assumed to be in the nature of a primary stimulus (though not necessarily an adequate one), then the studies of McKinnon and Ross are relevant in this connection. They found among some three thousand toxoid reactors approximately one quarter the expected rate of diphtheria as compared with that occurring in a control group of school children. Laboratory studies have shown that the antitoxin titre of the serum of approximately twenty-five per cent of reactors (adults) is less than one hundredth of a unit. Unfortunately a titration at a lower level was not carried out. This agreement between the findings of the laboratory and of the field survey strongly suggests that approximately three quarters of the toxoid reactors are immune and one

quarter susceptible to diphtheria. Sensitivity then is not necessarily a manifestation of an adequate primary stimulus. Similarly, a previous experience consisting of an injection of diphtheria toxoid may not constitute an adequate primary stimulus.

The only answer, however, to the question of whether one dose of an antigen, or of attempts to produce active immunity by whatever means, is adequate or not will ultimately be based upon the results of a careful statistical survey of experience in the field and extended over a period of years such as has been recently made by McKinnon and Ross in school children in Toronto. The responsibility for abandoning an effective agent against diphtheria such as three doses of toxoid appears to be, is one which cannot be lightly dismissed.

There is a strong suggestion that the higher the level of antitoxin induced by active immunization the longer will it take before it will drop below the Schick level, in the absence, of course, of an intercurrent diphtheria infection. With the diminution of diphtheria in any community the chance of infection is reduced. In addition, diphtheria does occur even among children who have had three doses of toxoid. It would seem reasonable then to use an antigen in such dosage, compatible with the exigencies of administration control, as to induce the maximum response in antitoxin.

There is one serious criticism of the study. The number of children on whom the comparison of the toxoid preparations is based is absurdly small in comparison with the hundreds reported upon in the United States. Publication of the results is perhaps justifiable because of a certain novelty of method employed, in that one batch of thoroughly tested toxoid was used throughout the experiment and that antitoxin titrations formed the basis of assessing the response to the antigens and not the Schick test, which is essentially qualitative and only roughly quantitative. The study should be continued and extended, especially among preschool children.

THE MEDICAL OFFICER OF HEALTH AND TUBERCULOSIS

IT may be said with a measure of justification that articles on tuberculosis published in medical journals are often too technical and do not have a direct message for the medical officer of health. The publication in this issue of the papers by Dr. D. A. Crombie and Dr. W. J. Dobbie is an answer to such a comment. These two papers have been prepared especially for the medical officer. Although referring to conditions in Ontario, the survey of existing services and the outline of a provincial program will be read with great profit by health officers throughout the Dominion.

The papers are distinctly critical in their approach; they are, however, highly constructive and present the practical aspects of tuberculosis control from the health officer's standpoint. No clearer presentation of the health officer's responsibilities, and of the ways in which he can discharge satisfactorily these responsibilities, can be asked. The Association is indebted to the authors for the preparation and presentation of these papers at the annual meeting last June.

REPORTS

from the

Twenty-fourth Annual Meeting

Held in Toronto June 3, 4 and 5, 1935

Part V

HONORARY LIFE MEMBERSHIP

IN establishing honorary life membership the Association desired to have the opportunity of honouring distinguished public health workers who, through their contributions, have promoted public health. To this honour roll the Association this year added the names of Surgeon-General H. S. Cumming of the United States Public Health Service, Professor H. W. Hill, and Dr. M. Stuart Fraser as recipients of honorary life membership in the Association.

The Association was indeed honoured by the acceptance of this evidence of its appreciation by Dr. Cumming, who on many occasions has expressed his interest in the Association. In honouring two of the Association's distinguished members, Professor Hill and Dr. Fraser, the Association paid tribute to their meritorious work in the advancement of public health in Canada.

It was indeed a great disappointment that the certificates of honorary life membership had to be presented *in absentia*, owing to the inability of Professor Hill and Dr. Fraser to be present, and particularly as word had been received of Dr. Cumming's illness which confined him to hospital. In their absence, Dr. W. J. Bell, Chairman of the Executive Committee, spoke of their contributions and of the honour which their election brought to the Association. Dr. F. W. Jackson, as President, expressed on behalf of the Association the appreciation of their services in public health on this continent.

Hugh Smith Cumming, Sc.D., LL.D. (Yale), is the fifth Surgeon-General of the United States Public Health Service. He was born August 17, 1869, at Hampton, Virginia, and was graduated in medicine from the University of Virginia in 1893. He entered the Public Health Service in 1894 as Assistant Surgeon and was promoted to the grade of Passed Assistant Surgeon in 1889 ,to Surgeon in 1911, and to Assistant Surgeon-General in 1918. In February, 1920, he was appointed Surgeon-General. The broad preliminary training which Dr. Cumming received in the many years of his work in the service has particularly fitted him for the position which he now holds as head of the Public Health Service.

Dr. Cumming has received the decoration of Commander of the Legion of Honour of France, the decoration Commander Polonia Restituta of Poland, the Order Al Merito of Ecuador, and the Order of Carlos Finley of Cuba. During the world war he was detailed to the Navy as adviser in sanitation, and later was in charge of Public Health Service activities in Europe relating to sanitation, returning troops and the resumption of trade. He then served as

President of the Interallied Sanitary Commission to Poland and it was from this work that he was recalled to the United States to assume the position of Surgeon-General in 1920. He is a Fellow of the American College of Surgeons, the American College of Physicians, the American Public Health Association, and the American Medical Association. He is a member of the Permanent Committee of the Office International d'Hygiène Publique and is the official representative of this body on the League of Nations Committee. As the representative of the United States on many international commissions he has rendered important services. His nomination by the President on March 10, 1932, for a fourth term as Surgeon-General expresses the high appreciation of the services which he has given to the United States.

In addition to the duties directly connected with the Public Health Service, Dr. Cumming has given generously of his time to the Board of Hospitalization concerned with the care of returned soldiers and to the many official and voluntary health-promoting agencies. He has served as President of the Southern Medical Association, the American Public Health Association, and of the Association of Military Surgeons. Throughout the years of his administration he has extended many official courtesies to the public health workers of Canada and continues to manifest an unfailing interest in our Canadian problems.

M. Stuart Fraser, B.A., M.D., C.M., graduated in arts from the University of Manitoba in 1887 and in the Faculty of Medicine of the same university in 1890. In the following year he undertook post-graduate study in Edinburgh. For some years he was engaged in general practice in Brandon. In 1916 he was requested by the Provincial Board of Health of Manitoba to accept the position of Provincial Epidemiologist. His interests and responsibilities in the department, however, were not confined to the control of communicable diseases. He early urged the appointment of public health nurses and was successful in establishing a provincial public health nursing service in 1917—the first to be established in Canada. As an epidemiologist Dr. Fraser evidenced a rare appreciation of the essentials, and the published reports of studies which he conducted bear witness to the thoroughness of his investigations.

Dr. Fraser continued as Epidemiologist until 1928, when the Provincial Board of Health became the Department of Health and Public Welfare. In the reorganization he was appointed Chief Health Inspector, the duties of which position he filled with great credit until he reached the retiring age in 1932. For more than fifteen years he served the University of Manitoba as Lecturer in Public Health, resigning from this appointment on his retirement from the Provincial Department. Throughout the years he has been an active supporter and adviser of the Canadian Public Health Association and has given freely of his time also to the American Public Health Association as a member of the Governing Council.

Dr. Fraser is one of that small group of distinguished sanitarians of Manitoba to whom the greatest credit is due for laying the substantial foundations on which the present effective public health organization has been built. No

cause had a greater appeal to him than that of suffering children. On the public platform and in newspaper articles he outlined how much of this suffering was unnecessary, urging the continued supervision of children by their family physicians, the organization of child health clinics, and the provision of public health nurses to serve the whole province. Few physicians can have greater satisfaction than Dr. Fraser as he sees the striking results achieved by the efforts of the earlier years in the improvement of the public health.

Hibbert Winslow Hill, M.D., D.P.H., LL.D. (*West.*), was born in Saint John, N.B., in 1871 and received his primary education in Woodstock. He graduated in medicine from the University of Toronto in 1893 and was appointed Demonstrator in Pathology and Bacteriology and in charge of the clinical laboratory of the Toronto General Hospital. In 1895 he undertook a post-graduate course in bacteriology at the Johns Hopkins Hospital and during the following years served as Director of the Bureau of Laboratories, Brooklyn Health Department, and subsequently of the Boston Board of Health Laboratory from 1898 to 1905. During his residence in Boston he was Instructor in Bacteriology at Harvard Medical School. In 1905 he was appointed to the Minnesota State Board of Health Laboratories and also Assistant Professor of Bacteriology in the University of Minnesota. In 1912 he became Director of the newly established Institute of Public Health in the University of Western Ontario, London, and Professor of Public Health. He was granted leave of absence in 1914 to serve as Executive Secretary of the Minnesota Public Health Association, returning in 1915 as Director of the Institute of Public Health and Medical Officer of Health of the City of London. During the war he served on the Headquarters Staff with the rank of Captain as adviser in sanitation. At the conclusion of the war, Dr. Hill returned to Minnesota as Executive Secretary of the Minnesota Public Health Association, but remained for only one year, resuming the directorship of the Institute of Public Health in London. In 1925 he accepted the appointment of Director of Laboratories of the Vancouver General Hospital and Professor of Bacteriology and Nursing and Health in the University of British Columbia.

Dr. Hill was the first bacteriologist to serve in a full-time capacity in Canada and he was one of the pioneer epidemiologists in the United States. In numerous scientific articles he presented the results of his studies and investigations, approaching the problems with a vigour and enthusiasm that enabled him to make substantial contributions in bacteriology and allied fields. He is the author of *New Public Health*, *Sanitation for Public Health Nurses*, *The New Hygiene*, and other volumes, all of which expressed his keen, critical evaluation of existing public health methods. With a deep sense of the obligation of the profession to the public, Dr. Hill has contributed many popular public health articles for the press, interpreting as few can the essentials of public health. Through illness Dr. Hill has been forced to relinquish active duties, but his pen continues to lead the thoughts of all public health workers on this continent to the real values in public health.

REPORT OF THE COMMITTEE ON RESOLUTIONS

THE Chairman of the Resolutions Committee, Dr. M. R. Bow, presented the following resolutions, which were unanimously adopted by the Executive Council and approved by the annual meeting in Toronto, June 5, 1935.

BE IT RESOLVED:

1. That the thanks of the Canadian Public Health Association be tendered to the Press of Toronto for the generous allotment of space given to the papers and deliberations of this convention.

2. That the Association extend to the management of the Royal York Hotel their sincere appreciation of the excellent service provided for the members during the time of the convention.

3. That the felicitations of the Canadian Public Health Association in convention be extended by a representative of the Association to the American Public Health Association at the time of their annual meeting.

4. That the Association note with deep regret the deaths of several of its members during the past year and request that the Secretary be instructed to convey to the members of their families the sympathy of the Association in their bereavement.

5. That the Secretary be requested to convey to Dr. H. S. Cumming, Surgeon-General of the United States Public Health Service, the regret of the Canadian Public Health Association at his inability to be present at its meeting and that hope be expressed for his early and complete recovery of health.

6. That the Secretary be requested to convey to Dr. E. L. Bishop, President of the American Public Health Association, the regret of the Association at his inability to be present at the conference and that hope be expressed for Mrs. Bishop's early and complete recovery of health.

7. That the grateful appreciation of the Canadian Public Health Association be conveyed to the Commonwealth Fund for the attendance of Dr. C. L. Scamman at the conference and for the contributions made by him to the deliberations of the Association.

8. That this Association congratulate the Honourable the Minister of Health for the Dominion, the Honourable Dr. Donald M. Sutherland, on his far-sighted action in calling a conference of provincial ministers of health to discuss plans for co-ordinated action for health conservation throughout Canada;

Furthermore, that this Association endorse the action of the conference in respect to the resolution moved by the Honourable Dr. J. A. Faulkner, Minister of Health for Ontario, and seconded by the Honourable Dr. F. A. Davis, Minister of Health for Nova Scotia, and passed unanimously:

> "That a Royal Commission be formed to study health services of Canada with a view to the development of a co-ordinated program for the control of illness";

And, further, that the Association urge that immediate steps be taken:

> Firstly, to convene the previously mentioned Royal Commission on Health.
> Secondly, to formulate a co-ordinated public health program.
> Thirdly, to put this program into effect on a Dominion-wide basis.

The Conference also approves of the plan suggested for the formation of a permanent Cabinet of Health, to be composed of the Minister of Health for the Dominion with the Ministers of Health for the provinces, meeting together to discuss health conservation plans for the Dominion.

RESOLUTIONS FROM THE VITAL STATISTICS SECTION

BE IT RESOLVED:

1. That this Association endorse the recommendation of the Special Committee of the Vital Statistics Section on the Annual Report of the Medical Officer of Health, with the amendment that the annual report of the medical officer of health be for the municipal year.

2. That this Association endorse the report and recommendations of the Committee on the Certification of Causes of Death of the Section of Vital Statistics—including a further consideration and application of methods for the education of medical students and medical practitioners in the principles and practice of death certification, and a detailed investigation of various phases of the problem of foetal mortality.

3. That the Section of Vital Statistics of the Association express its appreciation of the excellent work of the Dominion Bureau of Statistics and the generous co-operation which has been extended to various committees of the Association making special studies, and for its splendid leadership in vital statistics throughout Canada.

REPORT OF THE COMMITTEE ON NOMINATIONS

THE following report of the Nominating Committee, under the chairmanship of Dr. George D. Porter, was unanimously adopted by the Executive Council and approved by the annual meeting in Toronto, June 5, 1935.

OFFICERS, 1935

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Representatives of Provincial Associations

Alberta Health Officials' Association, Dr. A. C. McGugan, Edmonton; Saskatchewan Health Officials' Association, Dr. T. A. Patrick, Yorkton; Ontario Health Officers' Association, Dr. A. E. Ranney, North Bay; Nova Scotia Health Officers' Association, Dr. F. O'Neil, Sydney.

Executive Committee

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Industrial Hygiene: Chairman, Dr. F. M. R. Bulmer, Toronto; Vice-Chairman, Dr. J. G. Cunningham, Toronto; Secretary, Dr. O. A. Cannon, Hamilton.

Laboratory: To be elected at the Christmas meeting of the Section.

LETTER FROM GREAT BRITAIN

GEORGE F. BUCHAN, M.D., F.R.C.P., D.P.H.
London

HEALTH CONGRESS OF THE ROYAL SANITARY INSTITUTE

BOURNEMOUTH provided the Health Congress with splendid weather during the period of the Conference this year from July 15th to 20th. The 1935 Congress will go down in history as one of the most successful congresses, if not indeed the most successful, ever held by the Institute. It was exceptionally well attended. Local health authorities sent some 1,100 out of a total of nearly 1,600 delegates.

As usual the Congress was divided into sections and conferences and many papers were read during the five days of the Congress. These papers covered practically the whole field of public health and included housing, hospital construction, veterinary hygiene, hygiene in industry, and preventive medicine in all its aspects. Where all the subjects were of importance it is difficult to single out one, but the discussion on the training of health visitors was certainly most useful. The duties of a health visitor or, as she is sometimes called, a public health nurse are so multitudinous that a course of training to cover experience in all her work would probably last a lifetime. It was, however, generally agreed by the Conference that, given a candidate with a good general education, the basic training for a health visitor should be general nursing training.

One of the most enjoyable functions which takes place in connection with the Health Congress annually is the luncheon given by the Council of the Royal Sanitary Institute to overseas delegates. This was a very well attended and an extremely happy event. It was presided over by the Chairman of the Council, W. T. Creswell, Esq., K.C., who succeeded in making everyone feel at home. I was sorry that none of my colleagues from Canada were able to be present. I hope that some way may be found in the future so that there is reciprocal representation of the Canadian Public Health Association and the Royal Sanitary Institute at their respective Congresses.

THE BED BUG AND HOUSING

EVER since the Great War an increasing amount of effort has been directed towards improving the health and living conditions of the poorer sections of the community and the question of vermin and its eradication has come more and more into prominence. Especially during the last few years in connection with slum clearance and rehousing schemes has the attention of local authorities been focused on the subject. A local authority is bound as landlord to maintain a high standard of cleanliness in its houses and the discovery that the bed bug, one of the evils which slum clearance schemes were designed to remove, had spread to the new housing estates has been distinctly disquieting.

Several interesting and instructive reports and memoranda have been issued on the subject recently, notably one by the Department of Health for Scotland, "The Bed Bug—Prevention of House Infestation" in 1933, a Report on "The Bed Bug" issued by the Ministry of Health in 1934 and a Memorandum on "The Bed Bug and How to Deal with it" issued by the Ministry of Health in 1934. This Memorandum was the outcome of a recommendation contained in the Ministry of Health Report that as it was of first importance that sanitary officers and health visitors should be thoroughly conversant with the signs of infestation by bed bugs an instructional memorandum should be prepared and

issued to local authorities for distribution to all sanitary officers and health visitors. From these reports it appears that the control of bed bug infestation, broadly speaking, may be grouped under the headings:

(*a*) The prevention of the dissemination of bed bugs;

(*b*) The destruction of bed bugs in inhabited and in empty houses; and

(*c*) The elimination of bed bug harbourages in new houses.

Sources of Infestation.—The principal methods and sources of infestation are:

(1) The removal of infested furniture, bedding, etc., from house to house;

(2) Second hand furniture and bedding;

(3) The migration of bed bugs from room to room or from house to house; and

(4) The use of wood from infested premises as firewood or for any other purpose.

The first of these, namely, the removal of infested furniture from infested houses to new houses, is by far the most potent factor in the dissemination of bed bugs.

Prevention of Infestation and Methods of Extermination.—In the prevention of dissemination of bed bugs the reports are insistent on the importance of adopting the ordinary methods of spring-cleaning combined with knowledge of the habits of the bed bug so that all possible harbourages may be recognised and dealt with. The principal harbourages are:

(*a*) In stuffed and upholstered furniture:

(i) In the seams and under the leather buttons of mattresses;

(ii) In the wire of the bed springs;

(iii) The undersides of chairs, settees, etc.

(*b*) In the structure of the house:

(i) Behind wall paper and ceiling paper;

(ii) Behind door and window architraves, picture rails, skirting boards, cupboards fixed to walls;

(iii) In cracks in plaster, nail holes and particularly where hot water pipes are embedded behind the plaster.

(*c*) Backs of pictures and in boxes left undisturbed for some time.

The process of "spring cleaning" should be carried out as far as possible by the tenants themselves. In the report issued by the Department of Health for Scotland details of the methods adopted in Glasgow to prevent transference of bed bugs from house to house are given. In the main they consist in visiting and educating the tenants in the practice of household cleanliness, particularly the thorough scrubbing and cleaning of all articles with soap and water by the tenants themselves under supervision. Bedding is treated by the usual method of steam disinfection. The great value of this Glasgow report is the emphasis which it lays upon the inculcation in the tenants of sound principles of cleanliness, without which reinfestation will almost certainly occur sooner or later.

Contact insecticides may be used as supplementary to an organised scheme of cleaning. The following formulae are given by the Ministry of Health as having been found useful and cheap:

(i) Paraffin oil.....50 gallons
Ortho-dichlor-benzene..... 2 gallons
Methyl salicylate..... 1 gallon

(ii) Paraffin oil (B. Pt. 170° C. to 240° C.).....1,000 parts
Oil of mirbane (Nitro-benzene) 2 parts
Cresol..... 2 parts
Pyrethrum flowers (ground). 10 parts
The pyrethrum is soaked in liquid for 24 hours and the mixture then filtered clear.

Fumigation is also important in the treatment of furniture, particularly the upholstered furniture of tenants moving from one house to another. Such fumigation is, as a rule, carried out in specially constructed removal vans. Hydrocyanic acid gas is used and the fumigation is carried out only by trained and responsible persons.

Shortly before a move takes place the house is visited and thoroughly inspected. If bed bugs are found to

be present the tenants are instructed in the methods to be adopted and measures taken to start the tenants in the new house free from bed bug infestation. It should be borne in mind that fumigation, though it may destroy bed bugs, does not prevent reinfestation and after the removal is completed the care and diligence of the tenant are the main factors in preventing such reinfestation. The inculcation of habits of cleanliness amongst these transferred slum dwellers must be the primary objective of health officers.

THE MEDICAL OFFICER OF HEALTH

ARISING out of special surveys of Public Health Services carried out by the Ministry of Health, the last published Annual Report of the Ministry of Health (1933-34) draws attention to the importance of the Medical Officer of Health as a factor in the health organisation of a local authority.

"It is doubtful how far it is generally realised to what extent the standard of the health services in any area is influenced by the skill and ability of the Medical Officer of Health, yet the most striking fact that has emerged from the surveys is the predominant importance of the Medical Officer of Health as a factor in the health organisation of a Local Authority. Indeed it may be said that a capable Medical Officer of Health is by far the greatest asset which any Health Authority can possess. It has to be remembered that as a result of the provisions of the Local Government Act, 1929, the health services of County and County Borough Councils now embrace nearly every branch of medicine. It is the Minister's view that the Medical Officer of Health ought to be the chief adviser to the Council on all matters of general medical administration connected with the Authority's medical services, by whatever Committee they may be administered. (*a*) He is the administrative head of the Public Health Department and must exercise direct supervision over the work of the public health staff. He should also, in the Minister's opinion, supervise all the medical services of the Authority, including the hospital, institutional and district medical officer services. In the latter capacity he should endeavour to intervene as little as possible between any medical officer employed by the Authority for clinical duties and the patient whom that medical officer is treating, and should, so far as practicable, refrain from interfering with the clinical discretion of these officers. (*b*) It is his duty to advise his Council on the measures necessary to effect co-ordination of all health and medical services, with a view to building up an adequate organisation for the prevention and cure of disease. It is also in the public interest that he should do all in his power to promote good relationships between his Council and the voluntary hospitals in the area and that he should be in close touch with the local medical profession."

The Minister goes on to say that in order to carry out the multifarious duties expected of him with tact and efficiency, the Medical Officer of Health of a County or County Borough should possess wide experience, sound knowledge of public health procedure and a personality which will inspire the confidence and maintain the respect of his Council. He should be able to visualise the future as well as the immediate needs of the area and to utilise to the full advantage the available resources. He must be a man of broad outlook with one aim in view, namely, the development of the health services in the manner best adapted to the needs of the area and so that they may achieve the best results with the least expenditure which is consistent with efficiency. He should possess a clear understanding of the general principles underlying each phase of public health activity while relying for the details of administration upon the expert knowledge of the medical officers engaged in the special branches. Most important of all, the Medical Officer of Health must have organising ability and the administrative outlook.

These views and expressions of opinion are quoted in order to give some idea of the importance attached to the growth of public health in this country and to the need for effective personnel. It would be too much to say that every Medical Officer of Health possesses all the knowledge and virtues recited but it is pleasing to record that the office is held to be one of the highest importance in local government.

INDUSTRIAL HYGIENE

EARLY TREATMENT IN INDUSTRIAL ACCIDENTS*

E. C. JANES, M.B.

McGregor Clinic, Hamilton, Ontario

IF the early treatment of an injury sustained in industry is inadequate, any or all of the following factors may be involved: the employee, the employer, the medical department, the Compensation Board, the hospital, and various departments such as x-ray and physiotherapy. From the standpoint of this paper, however, I must refer particularly to the early medical care.

We all know how a trivial injury, if not cared for, may result in serious disability or death; for example, we have all heard of a mere scratch causing a person's death from "blood poisoning". Antiseptics are of very little value once an infection is established. They are, however, of very great value if used immediately after the skin has been broken and before bacteria which may have been introduced have had time to multiply. Every patient who receives a skin cut, or scratch, or brush burn, should be sent immediately to a first-aid department to have the wound cleansed and an antiseptic applied. How many stiff joints, lost fingers and disabled hands could be prevented if this practice were adhered to faithfully!

Compound fractures constitute some of the most acute emergencies. If treated within two hours of the accident almost all such fractures will heal without serious infection. If not treated for six hours about half of them are infected, and after twelve hours infection is almost certain. If they are treated early, the bones placed in proper position, and fixation maintained, it is not nearly so serious if infection does develop. If it is not necessary to shift the fragments during the time that infection is present, the vast majority of them will heal without serious damage; but if one has to wait for an infection to clear away before treating the fractures, the problem is multiplied many times.

As an illustration, there is the case of a workman who received a compound fracture of a leg while working at night. This particular plant does not employ a regular physician but the employees may call whom they wish. The patient was admitted to hospital, but the physician who was called either did not wish to disturb a surgeon at that hour or did not realize the danger of delay. The surgeon saw the patient about nine hours after the accident. All chance of cleansing the wound and obtaining healing by primary union was gone. The fracture became infected; and now, many months later, the patient has had two amputations of his leg and is still in bed.

Another example of a fracture case is quoted to show that all departments of a hospital must be correlated for efficient care of injuries. A workman was admitted suffering from a Potts' fracture of his left ankle and a very serious comminuted fracture of the right leg which necessitated amputation. It was obvious that a good functional result in the left ankle was essential. After a cast was applied, x-rays were taken and the report stated that the fracture was in excellent position. Several weeks later, when the cast was removed, there obviously was something wrong. It was found that the technician had taken only antero-posterior views of the ankle. The busy radiologist and surgeon did not realize that the lateral view was missing. New plates

Abstract of paper presented before the Industrial Hygiene Section at the Twenty-fourth Annual Meeting of the Canadian Public Health Association, Toronto, June, 1935 (joint session with the Ontario Health Officers' Association).

showed that there was a partial posterior displacement of the foot at the ankle. It was too late to correct it entirely, and as a result this man has a painful ankle joint in the leg that now has to support him and help him carry an artificial leg. Such a result reflects most unfavourably on the surgeon and must have cost the Compensation Board a great deal of money. Much suffering and expense could have been prevented by an efficient x-ray department.

When a workman sustains an injury that breaks the skin it should be obvious that nerves or tendons may have been severed, and the extremity should be examined for such injury. Failure to determine such damage, particularly to tendons and nerves, may result in prolonged disability and cost. For example, a motor mechanic received a cut over the knuckle of his right hand by having his hand slip from a wrench and strike against a protruding piece of metal. He was sent to a physician who sutured the skin cut. Three weeks later, because of persisting disability, he consulted another physician who examined him properly and determined that the extensor tendon to his right middle finger had been severed. Obviously this should have been sutured immediately after the accident. The first physician consulted would expect the Compensation Board to pay him for his services, but could he honestly expect recompense for such inefficient service?

As an example of an unrecognized nerve injury, a man received a severe cut over the inner surface of his left elbow in 1929. The cut was sutured and healed well. Six years later he reported to a surgeon, complaining of numbness which had been present in his fourth and fifth fingers since his accident. Exploration of his ulnar nerve showed that it had been about two-thirds severed and a large neuroma had formed. Nerve suture was necessary. The result will probably be quite good but there had been six years' delay.

The lesson to be learned from these case reports is that an efficient medical service in any industry may prevent prolonged disability and suffering and be economically sound.

The most popular early treatment of burns is applying some sort of greasy dressing, such as carron oil. This is done to alleviate pain and always before the burned area is cleansed. Nothing could be worse. Carron oil is a filthy substance, chiefly linseed oil and limestone, and originated, I believe, in the dockyards of Scotland. If large areas are burned, they should be thoroughly cleansed and then tanned. If the burn is small, it should be cleansed and then an ointment may be used. Pain can be controlled with sedatives. Bicarbonate of soda solution makes a comfortable dressing, and even if applied early does not interfere with cleansing.

Workmen who receive severe injuries always suffer more or less from shock. Although it is advisable to get them into hospital quickly, much harm may be done by transporting a shocked patient in his cold, wet clothes in a cold, draughty ambulance over rough roads to hospital. It would be much more sensible to take the man to a bed in a first-aid room. The bed would be kept constantly warm and would be well supplied with hot blankets. After he had been given sedatives for pain and thoroughly warmed for an hour or more, he would be in much safer condition to tolerate the uncomfortable ride to hospital for further treatment.

Much is written and talked about physiotherapy in the rehabilitation of injured workmen. My feeling is that much needless money is spent when one considers the results obtained. The prospect of getting back to work should always be kept in the patient's mind, and I believe that the best physiotherapy is light work in the industry that employs him. The psychological effect is good; if a man is given a job sweeping

or cleaning benches, where he can see his fellow workmen doing their regular work, he will soon demand that he be put back to his regular duties. Massage or heat treatments can be rendered by first-aid employees or nurses at the plant. Expensive apparatus is usually not necessary, and again the psychological effect is good because the man gets into the habit of returning daily to his regular place of work and the desire to resume his duties will grow.

At the Hamilton Works of the Steel Company of Canada, two to three hundred minor accidents are treated each month, exclusive of eye cases. The medical department has been organized and is supervised by Dr. Oscar Cannon and an assistant. There are now four first-aid men and no nurses. Since the inception of this scheme in 1928 no compensation has been paid for infections occurring in injuries received while working. There is also a sick benefit plan, and a great deal of money has been paid out for infections following accidents outside of the plant. Even the most trivial injury at this plant must be reported and failure to conform to this rule means the discharge of the employee.

The details of such a service need not be given here, but my own experience leads me to certain conclusions. The ideal arrangement would be to have all injuries, no matter how trivial, treated by a qualified medical practitioner. Obviously this is not practicable in all instances. It is possible and practical, however, for every small plant, no matter how small, to have a first-aid department organized and supervised by a medical man. A specified physician should be called for all accident cases. He should be appointed by the employees or the employer, or both, probably with the help of the local medical organization. With such an arrangement it is possible for efficient treatment to be rendered by lay first-aid employees or nurses, because they will be working in a department properly organized and under the correct type of supervision. A casual arrangement whereby the injured employee or his foreman may call any doctor in case of an accident must invariably prove unsatisfactory. It would also seem desirable that regular consultants be employed. In this way a more harmonious working arrangement is possible. Surgeon and physician together can estimate a disability more accurately if they learn the type of work required of an injured person. Under present arrangements there is too much financial loss to a physician to refer an injured patient to a surgeon unless it is absolutely necessary. He should be allowed to collaborate in the treatment and be adequately remunerated.

One feels that the Compensation Board will usually pay fair fees for services rendered if they understand the case thoroughly. Many complaints are heard because the cheques received are almost always for less than the accounts rendered. Many doctors have suggested that the Board sends a smaller fee than that asked for, with the thought that if it is accepted, so much money has been saved. Such a practice would have evil results because doctors might send in accounts larger than they should be because they expect to receive a smaller amount. The correct practice is to send in an account for a fair fee, based on an itemized statement, and be prepared to justify the account if it is questioned. It is often not possible to describe a case completely in the prescribed report forms, but an enclosed letter will easily clarify the situation for the Board. X-rays or photographs will frequently be of great assistance.

Early medical care in industrial accidents is of first importance. It is, however, only part of a well planned and properly conducted organization which is necessary in a plant if the health of the workers is to be protected.

NEWS FROM THE FIELD

Appointment of the Hon. Mr. I. B. Griffiths as Minister of Health and Public Welfare, Manitoba

ON May 28, 1935, announcement was made of the appointment of Mr. I. B. Griffiths, M.P.P., as Minister of Health and Public Welfare for Manitoba, relieving the Hon. Mr. R. A. Hoey, Minister of Education, who had assumed the responsibilities of the Department of Health and Public Welfare in addition to the portfolio of Education.

THE HON. MR. I. B. GRIFFITHS

Mr. Griffiths was born in Walsall, England, in 1883 and graduated from South Wales College. Coming to Manitoba in 1903, Mr. Griffiths engaged in farming and became closely associated with the United Farmers movement in Manitoba, being director for the electoral division of Marquette for several years. He entered the legislature in 1922 and was appointed Deputy Speaker in the House in 1932. The Hon. Mr. Griffiths brings to public health work a thorough understanding of the rural conditions in Manitoba and a keen interest in the improvement of health and public welfare.

Dr. H. E. Young Honoured

AT the annual meeting of the State and Provincial Health Authorities of North America held in Atlantic City on June 15th, Dr. H. E. Young, LL.D., Provincial Health Officer of British Columbia, was elected president. A further honour was conferred by the Western Branch of the American Public Health Association in naming him president-elect at its meeting in Helena, Montana. The Western Branch will hold its annual meeting in conjunction with the Canadian Public Health Association in Vancouver next June, at which time Dr. Young will be installed in his new office.

British Columbia

ANNOUNCEMENT was made recently by the Hon. G. M. Weir, Provincial Secretary, that provision of needed tuberculosis beds in the Vancouver district will be made in a building adjacent to the present chest clinic at the Vancouver General Hospital. The cost is estimated at $100,000 and the building will provide 70 beds and a clinic.

Saskatchewan

DR. R. G. FERGUSON, O.B.E., Medical Superintendent of the Saskatchewan Anti-Tuberculosis League, was elected president of the Canadian Tuberculosis Association, succeeding the retiring president, Dr. J. A. Couillard, at the annual meeting in Toronto last June.

Dr. O. C. Gruner has been appointed to the staff of St. Paul's Hospital, Regina, as full-time pathologist.

Dr. T. Douglas Kendrick, D.P.H., has accepted an appointment at the Mayo Clinic, Rochester, Minn., having resigned his position in the Provincial Department of Public Health.

Manitoba

THE twenty-fifth anniversary of the founding of the Manitoba Sanatorium at Ninette was celebrated on September 14th. Addresses were given by the Lieutenant-Governor and the Premier of Manitoba, the Mayor of Winnipeg, and members of the Sanatorium Board. Congratulations were extended to Dr. D. A. Stewart, Superintendent, for his splendid services not only in the establishing of the sanatorium but in the whole anti-tuberculosis program in Canada.

Ontario

AMONG the physicians enrolled for the course leading to the Diploma in Public Health at the School of Hygiene, University of Toronto, are Dr. R. H. Fraser, Winnipeg; Dr. H. L. Logan, Salisbury, N.B.; Dr. J. I. Rerrie, Jamaica, B.W.I.; Dr. E. J. Rutledge, Erickson, Man.; Dr. A. D. Lapp, Tranquille, B.C.; Dr. A. R. J. Boyd, Vancouver, B.C.; Dr. J. S. Sirois, Drummondville, Que.; Dr. Jean Paquin, Ste. Anne de Perate, Que.; Dr. Amie Gagnon, Donnacona, Que.; and Dr. S. W. Miller, Cannanore, Malabar, S. India.

BOOKS AND REPORTS

The Fifty-Ninth Annual Health Report of the Borough of Willesden, 1934. George F. Buchan, M.D., F.R.C.P., D.P.H., Medical Officer of Health. Wightman & Co., Limited, London, England. 105 pages, with tables and appendices.

Canadian health workers are always interested in learning of progress in municipal health work in England. The report for 1934 of Dr. George F. Buchan, Medical Officer of Health of Willesden, is of particular interest to the readers of the *Journal* because they have come to know Dr. Buchan through the quarterly letter on public health progress which he has so kindly contributed to the *Journal* during the past three years.

Willesden is one of the boroughs constituting the metropolitan area of London, with a population of 195,225. This borough is fortunate in that Dr. Buchan is director of the school medical services as well as medical officer of health, and correlates all public health work conducted in the municipality. An interesting feature of the public health activities in Willesden is the operation of two cancer clinics. The object of these clinics is to make early contact with the patient and to secure diagnosis and treatment if needed. If a patient is under the supervision of a private practitioner, the result of any examinations or advice as to treatment is forwarded to him.

In discussing the notified cases of infectious diseases during 1934, Dr. Buchan presents some interesting facts of experience in relation to the incidence of infecting and return cases of scarlet fever. Of 741 hospital cases, 28 gave rise to return cases within a 28-day period—a percentage of 3.8. The total number of case returns was 36 or approximately 5 per cent of the total hospital cases.

The divisional report on the Municipal Hospital contains some rather striking data on measles. During an epidemic in the spring of 1934, 143 cases were treated in hospital, 16 of which died. Ninety-three of the cases and 14 of the deaths were under five years of age, a case fatality rate of 15 per cent, in contrast to 4 per cent in those five years and over. A favourable experience in the use of measles convalescent serum in well chosen cases is reported.

The experience of the Willesden Maternity Unit has been highly favourable, no booked patient dying during the year. In 548 completed cases there were 6 Caesarean sections (3 for contracted pelvis and 3 for heart disease) and 29 forceps deliveries. The maternal death rate for the whole borough was only 3 per 1,000 live births and the infant mortality only 42 per 1,000 live births.

All detailed statistical tables are brought together in the appendices, thus reducing unnecessary detail in the text. An index would be a welcome addition to the report and a financial statement giving the per caput health expenditure in the area would be helpful.

The reviewer's copy will gladly be forwarded to any reader who may desire to study this most interesting and helpful report.

A.H.S.

Care of the Eyes. A pamphlet published by the Metropolitan Life Insurance Company, Canadian Head Office—Ottawa. Prepared with the co-operation and advice of the National Society for the Prevention of Blindness. 13 pages, with 5 illustrations.

Public education in health is without doubt the important channel through which the great part of our future progress in the conservation of life and health must come. Personal hygiene cannot be practised sanely, however, without a full appreciation of the facts.

This small pamphlet on the care of the eyes describes in simple language the physiology of the human eye. The importance of general health in relation to vision is emphasized. The essential yet simple laws for comfort and efficiency in seeing are outlined. Further topics briefly deal with warnings of eye trouble, the eyes in infancy and childhood, and the correction of eye defects. The meaning of farsightedness and nearsightedness is explained and illustrations are provided to show how glasses make it possible to correct these defects and provide clear vision. The remainder of this article is devoted to the hygiene of wearing glasses, communicable eye diseases, eye changes in middle and late life, and eye accidents.

This pamphlet is an excellent one. The facts are simply and clearly presented in an interesting and attractive fashion. There is a wide sphere of usefulness for such clear messages on health as this one.

A.H.S.